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INTRODUCTION.

This REVIEW contains a general summary of the meteorological conditions which prevailed over the United States and Canada during July, 1884, based upon the reports from the regular and voluntary observers of the Signal Service and co-operating state weather services.

Descriptions of the storms which occurred over the north Atlantic ocean during the month are also given and their approximate paths shown on chart i.

The number of atmospheric depressions, described under "areas of low barometer," is twelve, or three more than the average number for July during the eleven preceding years.

The month, as a whole, was remarkably cool, the temperature averaging below the mean over all the northern districts and in the Southern States east of the Mississippi river; the deficiencies were most marked from Dakota eastward to the lower lakes and in the northern plateau. Over the southwestern portion of the country, from the Mississippi to Arizona, and along the California coast the mean temperature was above the normal.

The rainfall was excessive on the Atlantic coast north of the Carolinas; in eastern Tennessee, the lower lake region, and in the Missouri and Arkansas valleys. It was below the average in the upper lake region, Ohio valley, and over all of the southern districts.

Drought prevailed in several states during the month, being most severe in Texas, where the rainfall for June also was deficient. The rains accompanying low area x. terminated the drought which prevailed in central Ohio previous to the 23d.

On the evening of the 3d a remarkably brilliant meteor was extensively observed, having been seen in Connecticut, New York, New Jersey, Pennsylvania, Virginia, and the province of Ontario, Canada.

The severest local storms of the month were associated with low areas iv.-v. and x.

In the preparation of this REVIEW the following data, received up to August 20th, 1884, have been used, viz.: the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and twenty-two Signal Service stations and fifteen Canadian stations, as telegraphed to this office; one hundred and fifty-eight monthly journals, and one hundred and fifty-four monthly means from the former, and fifteen monthly means from the latter; two hundred and fifty-nine monthly registers from voluntary observers; fifty-seven monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports, through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs, furnished by the publishers of "The New York Maritime

Register;" monthly weather reports from the local weather services of Alabama, Georgia, Illinois, Indiana, Iowa, Kansas, Louisiana, Nebraska, Ohio, and Tennessee, and of the Central Pacific railway company; trustworthy newspaper extracts; and special reports.

ATMOSPHERIC PRESSURE.

[Expressed in inches and hundredths.]

The mean atmospheric pressure for July, 1884, determined from the tri-daily telegraphic observations of the Signal Service, is shown by the isobarometric lines on chart ii. The mean pressure for the month is greatest over the north Pacific coast region and along the coast of the Gulf of Mexico. As is usual during the summer months, an area of barometric minima occupies the middle and southern plateau regions, where the mean pressures are below 29.8. A second area of barometric minima is also shown over the Gulf of Saint Lawrence, where the pressure falls to 29.74 at Father Point, Province of Quebec. To the eastward of the one hundredth meridian the mean pressures decrease with the increase of latitude from 30.0 along the Gulf coast, to slightly below 29.9 in the extreme northwest and lake region, and to 29.75 over the Gulf of Saint Lawrence. The highest barometric means for the month occurred in the north Pacific coast region—Olympia, Washington Territory, and Roseburg, Oregon, reporting 30.04, and Fort Canby, Washington Territory, and Portland, Oregon, reporting 30.05.

Compared with the mean pressure of the preceding month an increase is shown over Oregon, Washington Territory, and northern Idaho; along the immediate Gulf coast, and in the southern portions of Arizona, New Mexico, and Texas. The increase is most marked on the north Pacific coast, where, at Portland, Oregon, it amounts to .10. In all other districts there is a decrease, the deficiencies being unusually marked from the lake region, upper Ohio valley, and middle Atlantic states to the Canadian Maritime Provinces. Over portions of the provinces of Ontario and Quebec and in New England the barometric means vary from .25 to .27 below those for July.

Compared with the normal pressure for the month of July, deficiencies are shown over the entire country. From the one-hundredth meridian westward to the Pacific coast the departures are generally less than .05, while to the eastward of the region named they increase to from .10 to .13 over a narrow area extending in a northeasterly direction from the Indian Territory and eastern Texas to New England.

BAROMETRIC RANGES.

The monthly barometric ranges are generally more than .50 over the northern districts from Idaho to Lake Huron, and in northern New England, the maximum ranges for the month occurring in the last mentioned district, where, at Eastport, Maine, the range is .71. Along the coast of California; from Arizona eastward to the Mississippi river, and in southern Florida, the ranges are less than .30, the smallest being .16 at Fort Apache, Arizona, and .19 at Brownsville, Texas, and Prescott, Arizona.

In the several districts the monthly ranges varied as follows:

New England.—From .46 at New Haven and New London, Connecticut, to .71 at Eastport, Maine.

Middle Atlantic states.—From .39 at Norfolk, Virginia, to .45 at Albany, New York, and Cape Henry and Chincoteague, Virginia.

South Atlantic states.—From .32 at Jacksonville, Florida, to .40 at Kitty Hawk, North Carolina.

Florida peninsula.—From .27 at Key West, to .31 at Cedar Keys.

East Gulf states.—From .29 at Vicksburg, Mississippi, to .35 at Pensacola, Florida.

West Gulf states.—From .25 at Indianola, Texas, to .38 at Fort Smith, Arkansas.

Rio Grande valley.—From .19 at Brownsville, Texas, to .26 at Rio Grande City, Texas.

Tennessee.—From .33 at Chattanooga, to .38 at Nashville.

Ohio valley.—From .40 at Indianapolis, Indiana, to .46 at Columbus, Ohio.

Lower lake region.—From .45 at Sandusky, Ohio, to .50 at Buffalo, New York.

Upper lake region.—From .50 at Port Huron, Michigan, to .74 at Marquette, Michigan.

Extreme northwest.—From .45 at Fort Totten, Dakota, to .58 at Fort Buford, Dakota.

Upper Mississippi valley.—From .40 at Cairo, Illinois, to .60 at La Crosse, Wisconsin.

Missouri valley.—From .50 at Omaha, Nebraska, and Leavenworth, Kansas, to .57 at Huron and Yankton, Dakota.

Northern slope.—From .32 at Cheyenne, Wyoming, to .57 at Helena, Montana.

Middle slope.—From .28 on the summit of Pike's Peak, Colorado, and .29 at Fort Elliott, Texas, to .43 at West Las Animas, Colorado.

Southern slope.—From .21 at Fort Stockton, Texas, to .37 at Fort Sill, Indian Territory.

Southern plateau.—From .16 at Fort Apache, Arizona, to .28 at El Paso, Texas.

Middle plateau.—43 at Salt Lake City, Utah.

Northern plateau.—From .45 at Spokane Falls, Washington Territory, to .56 at Boise City, Idaho.

North Pacific coast region.—From .36 at Roseburg, Oregon, to .49 at Olympia, Washington Territory.

Middle Pacific coast region.—From .29 at San Francisco, California, to .38 at Red Bluff, California.

South Pacific coast region.—From .25 at Los Angeles, California, to .33 at Yuma, Arizona.

AREAS OF HIGH BAROMETER.

The month has been marked by an absence of well-defined areas of high barometer, but a single area having passed from the northwest to the south Atlantic coast. The tri-daily reports indicated the proximity of high areas to the north and northwest of the United States on the 4th and 16th, and the barometer was above the mean on the north Pacific coast from the 1st to 4th and from the 26th to 31st, indicating the existence of extended high areas over the north Pacific. In all cases of high areas observed the atmospheric movement was slight, and no marked change in the weather conditions were observed.

I.—The morning reports of the 4th indicated the advance of this area to the southward over the extreme northeastern states on the Atlantic coast, while an extended low area covered the central valleys and the Rocky mountain regions. The pressure increased on the northeast coast during the 5th, and this condition was followed by a decrease of pressure attending the low area which is traced as number v. The easterly winds on the New England and middle Atlantic coasts during the transit of this high area to the southeastward over the Atlantic were attended by a marked fall of temperature in New England and New York, which was only temporary, as the southerly winds which attended low area v. caused a corresponding rise in temperature on the 7th. This area probably extended far to the east of the coast line, and was only observed from stations in its southwest quadrant.

II.—A slight rise in the barometer occurred in the Mississippi

valley following low area v., the pressure being near 30.10 in the northwest on the 6th, with brisk westerly winds in the lake region, and southeasterly winds from the Mississippi valley to the Rocky mountains. The general drift of the atmosphere was to the eastward during the 7th, attended by cool, fair weather, while the highest barometer readings occurred successively in Iowa, the upper lake region, and north of Lake Huron, where this area disappeared under the influence of a low area from the west, and a second low area which apparently developed off the middle Atlantic coast on the 8th.

III.—This area was at no time wholly within the limits of the stations of observation. On the morning of the 15th it was observed advancing eastward from the region north of Manitoba. It extended to the southeastward over the lake region and adjoining states during the 15th and 16th, attended by cool, fair weather and light to fresh northerly winds, while severe local storms occurred in the Missouri valley and extreme northwest. The movement of this area can be readily traced to the southeast until the midnight report of the 17th, but the barometer fell during the last day of observation, and the area disappeared before reaching the Atlantic coast.

IV.—This area has been traced from the Saskatchewan valley, where it appeared on the morning of the 19th, over the usual southeasterly course of high areas, to the south Atlantic states, where it was central on the 23d. On the morning of the 20th it was central in Iowa, on the 21st in Indiana, and on the 22d in North Carolina. It appeared as an area bounded by an isobar of 30.0, but the pressure increased slightly after the centre passed to the south of Minnesota. The barometric readings at stations near the centre of this area were slightly above 30.1 until the 23d, when its course changed to the westward and the pressure slowly declined as the centre passed over Florida and to the south of the east Gulf states during the 24th and 25th.

AREAS OF LOW BAROMETER.

The areas of low barometer observed during the month generally developed slight energy within the limits of the United States; they were not well-defined and in most cases were either retarded in their easterly movement, or preceded by extended low areas in the plateau, or Rocky mountain regions. Twelve areas were traced from the tri-daily charts, only one of which number reached the Atlantic coast south of New England; one disappeared within the limits of the United States after passing from the Rocky mountains to the Ohio valley, and seven passed eastward over the lower Saint Lawrence valley.

The following table gives the latitude and longitude in which each area was first and last observed, and the average hourly velocity:

Areas of low barometer.	First observed.		Last observed.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
No. I.....	50 00	112 00	37 00	103 00	14.5
II.....	52 00	72 00	48 00	62 00	18.5
III.....	40 00	92 00	48 00	81 00	20.0
IV.....	47 00	99 00	51 00	94 00	31.0
V.....	45 00	91 00	51 00	68 00	30.0
VI.....	40 00	113 00	36 00	85 00	20.0
VII.....	38 00	70 00	52 00	64 00	21.0
VIII.....	49 00	89 00	47 00	60 00	15.0
IX.....	47 00	101 00	49 00	60 00	20.0
X.....	43 00	110 00	46 00	58 00	34.0
XI.....	38 00	88 00	39 00	74 00	23.5
XII.....	47 00	82 00	49 00	71 00	21.0
Mean hourly velocity.....					22.4

I.—The morning reports of the 1st placed the centre of this low area in British America north of Montana, with a well-marked high area west of Oregon, and a slight excess of pressure in Manitoba and Minnesota. The succeeding reports of the 2d and 3d showed this area moving first rapidly to the southward over the eastern slope of the Rocky mountains to

Colorado, where it became well-defined, and extended over all of the mountain districts. The movement became much retarded in the southern portion of its path, and after a slight advance to the eastward it disappeared, leaving an extended barometric trough to the northeastward, including within its limits the northwest and lake region, within which the secondary areas traced as numbers iii. and iv., developed.

II.—This was a slight disturbance which passed eastward far to the north of New England during the 2d, it being central north of Quebec at midnight of the 1st. It was at no time well-defined and was attended by no marked change in the meteorological condition of the regions under observation.

III.—When the disturbance traced as low area i., was central in southern Colorado, this area formed in the central Mississippi valley, and during the 3d and 4th it passed northeastward over the upper lake region, the centre of an extended rain area being immediately north of Lake Huron at midnight of the 4th. The succeeding reports indicated that this area joined number v., which developed in the eastern portion of the upper lake region during the night.

IV.—This secondary depression formed in northern Dakota, when low area number i. was central in northern Texas, and it apparently moved northward over Manitoba on the 4th, causing severe local storms and heavy local rains in the extreme northwest. During the night of the 4th the course changed to easterly, and by the morning of the 5th, it had united with number v., which was at that time central north of Lake Superior.

V.—As previously stated, this disturbance was first observed in the western portion of the upper lake region, attended by two secondary depressions, one to the east and north of Lake Huron, and the other over the northwest. These three depressions united on the morning of the 5th, and formed a storm of marked energy which passed eastward north of the lake region, attended by dangerous winds on Lakes Michigan, Superior, Erie and Huron, and general rains throughout the Northern states during the 5th. This storm apparently decreased in energy after passing to the northeast of the lake region. It followed the general course of the Saint Lawrence valley until the afternoon report of the 6th, when it was probably central north of Quebec.

VI.—This disturbance apparently resulted from the gradual fall of the barometer in the Rocky mountain region during the 5th and 6th, and reports from the extreme southwestern stations indicate that it may have originated in the Gulf of California or on the south Pacific coast. The general course of this area was northward over the Rocky mountains during the 5th, 6th, and 7th, when the centre of disturbance was in British America, north of Montana. At this point the course changed to the southeast, after which the disturbance followed the Missouri valley, passing over Missouri, southern Illinois, and Kentucky, and finally disappeared by a gradual loss of energy after reaching central Tennessee on the morning of the 10th. The heavy rains which occurred in the south Atlantic states on the 11th and in eastern Tennessee on the 10th probably resulted from the cool air attending the high area which followed this disturbance and caused the barometric depression to disappear, so that isobars drawn for every one-tenth inch failed to indicate the existence of this depression in the region named, but an examination of the barometric readings and wind directions exhibited by the tri-daily charts of the 10th and 11th would indicate that this disturbance either continued its southeasterly course to the coast or was immediately followed by a secondary depression, which caused the heavy rains and local storms referred to above.

VII.—This depression probably developed off the middle Atlantic coast during the night of the 8th. The reports from the coast stations indicate that a well-defined cyclonic storm of slight energy passed northward parallel to the coast. After reaching the New England coast the centre passed northward to the Saint Lawrence valley and disappeared. Strong gales occurred during the 9th at Yarmouth, Nova Scotia, and on the

coast of Maine when the centre of the disturbance was passing along the New England coast.

VIII.—This depression passed eastward north of the lake region during the 12th and 13th, the centre being north of Lake Superior at midnight of the 11th, and in the Saint Lawrence valley near Quebec at the 11 p. m. report of the 13th, when the barometer fell to 29.45. Fresh to brisk westerly winds prevailed in the lake region when the centre moved over the Saint Lawrence valley to northern New England, and dangerous westerly gales were reported off the middle Atlantic coast. This storm moved southeastward, as it approached the coast of Nova Scotia, with increasing energy during the 14th and when last observed it was apparently moving in a northeasterly direction, the centre being north of Sidney, where the barometer had fallen to 29.21, with brisk southerly winds. At this report—3 p. m. of the 15th—a northeasterly gale prevailed at Bird Rock, where the barometer read 29.28. When first observed the central area was inclosed by an isobar of 29.7, and when last observed the pressure had decreased to 29.30, this decrease having occurred gradually as the disturbance moved to the eastward.

IX.—The morning reports of the 17th exhibited a slight depression in the upper Missouri valley, attended by general rains in its northern quadrants, with relatively high areas over the lake region and on the north Pacific coast. This storm passed directly east over the latitude in which it was first observed, until the centre reached northern Nova Scotia when the course apparently changed to the north. No marked disturbance occurred within the limits of the United States during the passage of this storm over the lake region, but as the depression approached the Saint Lawrence valley its easterly movement was retarded, while strong gales occurred at the most northerly stations in the maritime provinces.

X.—This disturbance appeared north of the lake region as an extended area of low barometer on the morning of the 23d, but it probably developed in the Rocky Mountain region on the 21st, as the tri-daily charts show an ill-defined depression moving eastward over the course of the low area traced as number x. on chart i. Very heavy rains and dangerous gales occurred in the upper lake region when this storm passed over Lake Superior, the maximum velocities reported being 43 miles per hour at Milwaukee, Wisconsin, at 3 p. m. of the 3d, and 38 miles at Grand Haven, Michigan, at the morning report of the same day. This storm continued its easterly course, crossing the Saint Lawrence valley near Montreal, and passing over northern New England, and thence east of Sidney, Nova Scotia, disappearing on the 24th, although the barometer remained low in that region until the 26th.

XI.—On the morning of the 28th the barometer was generally below the mean for the month in the lake region and the central valleys, with an indication that a low area would develop in the lower Ohio valley. General rains prevailed south of the lake region during the 28th, and this depression passed directly east to the middle Atlantic coast, where it was central at the afternoon report of the 29th. The rain area extended over New England and southward to Florida, the greatest rainfall occurring near the storm centre. Dangerous easterly winds were reported off the New England and middle Atlantic coasts, and southwesterly winds, ranging in velocity from thirty to forty miles per hour, occurred on the North Carolina coast on the 29th. This storm probably followed the general course of the Gulf stream after leaving the middle Atlantic coast.

XII.—This was a slight depression which was located north of Lake Huron at midnight of the 30th. It apparently passed southward to Lake Ontario, and during the 31st moved northeastward over the Saint Lawrence valley as a storm of considerable energy. The centre was near Quebec at the close of the month, the barometer having fallen to 29.46 at that station, with strong southerly winds in the lower Saint Lawrence valley, and a marked barometric gradient to the southeast and southwest of the centre of the disturbance.

NORTH ATLANTIC STORMS DURING JULY, 1884.

[Pressure expressed in inches and in millimetres; wind-force by scale of 0-10.]

The paths of the atmospheric depressions that have appeared in the north Atlantic ocean during the month have been approximately determined from reports of observations furnished by agents and captains of ocean steamships and sailing vessels, and from other miscellaneous data received at this office up to August 20, 1884.

The observations used are in general simultaneous, being taken each day at 7h. a. m. Washington, or 12h. 8m. p. m. Greenwich, mean time.

Five depressions, none of which exhibited any marked storm-energy, are charted for the month of July, 1884. The depressions numbered 3 and 4 were apparently continuations of disturbances which passed over the United States and Canada; after moving northeastward to about N. 55°, W. 45°, they passed beyond the region covered by the reports. Number 5 probably developed near the coast of the United States on the 27th, and moved northeastward during the closing days of the month. Numbers 1 and 2 were first observed near the twentieth meridian; they moved northeastward along the British coasts. The weather over the north Atlantic during the month may be summarized as follows: 1st to 4th, strong winds to moderate gales from sw. to nw.; squally weather and high sea; 4th to 6th, generally light winds, very dense fogs west of W. 45°; 6th to 20th, moderate to strong w. breezes, generally disagreeable weather and dense fogs; 20th to the close of the month, strong w. breezes to moderate gales, heavy seas and squally weather, with dense fogs.

The following are descriptions of the depressions charted:

1.—This disturbance appeared north of the fiftieth parallel and between W. 15° and 25° on the 8th. On that date the s. s. "Wisconsin," C. L. Rigby, commanding, reported, in N. 50° 51', W. 22° 00', barometer 29.31 (744.5), wind wnw., force 7, rainy, squally weather. Vessels between N. 45° and 50° and to the westward of the twenty-fifth meridian had moderate w. and nw. gales, while those to the eastward of the "Wisconsin" had moderate s. gales with squally, rainy weather. The storm-centre moved slowly northeastward, and on the 9th the lowest barometric reading was observed on board the s. s. "Llandaff City," T. L. Weiss, commanding, in N. 51° 36', W. 20° 36', when the barometer read 29.1 (739.1), wind wnw., force 6, weather clear. Moderate nw. gales prevailed over the region from W. 20° to 35° and from N. 45° to 50°. During the 9th the disturbance moved towards the Irish coast.

2.—This disturbance apparently developed prior to the 11th in the region between N. 40° and 45° and W. 20° and 25°. By the morning of the 11th the barometer on board the bark "Sunbeam," Joseph Hand, commanding, in N. 40° 57', W. 25° 36', had fallen from 30.02 (762.5) to 29.55 (750.6) and the wind shifted from w. to wnw., and increased to force 8, weather cloudy; heavy rain fell for six hours during the interval between the observations of the 10th and 11th. To the northeastward of the "Sunbeam," the s. s. "Jason," D. H. Hinlopen, commanding, reported barometer 29.35 (745.5), wind sse., force 3, fair (ship's position, N. 49° 19', W. 20° 8'); vessels to the westward and northwestward had moderate n. and ne. gales with very high seas. By the morning of the 12th the region of least pressure was transferred to about N. 51°, W. 19°; on that date the s. s. "Eider," W. Willigerod, commanding, reported in N. 50° 21', W. 18° 40', barometer 29.18 (741.2), wind s., force 4, squally. The s. s. "British Princess," E. H. Freeth, commanding, in N. 49° 26', W. 23° 10', had barometer 29.26 (743.2), wind nne., force 6, clear. Other vessels to the westward of W. 25° reported strong n. and nw. breezes to moderate gales. On the 13th the centre of disturbance was near N. 53°, W. 18°, where the pressure was 29.22 (742.2); during the day it moved north-northeastward, and on the 14th it appeared off the northwestern coast of Ireland, the pressure at the centre remaining below 29.3 (744.2).

3.—This was probably a continuation of the disturbance described under "areas of low barometer," as number viii. During the 15th the disturbance passed to the eastward of Nova Scotia, and on the morning of the 16th, the centre was near the southern coast of Newfoundland. The disturbance moved slowly eastward and on the 17th the pressure was least in the vicinity of the fiftieth meridian and between N. 45° and 50°; during the day it moved northeastward and disappeared north of the fiftieth parallel, the lowest observed barometer reading being 29.59 (751.6.).

4.—This was a continuation of the disturbance traced over the United States and Canada as low area x. At midnight of the 24th the depression was central between Cape Breton Island and Newfoundland and by the morning of the 25th it was in Newfoundland. It moved northeastward during the day, and on the 26th the centre was apparently near N. 53°, W. 45°, whence it passed beyond the field of observation.

5.—This disturbance apparently developed near the coast of the United States between N. 35° and 40° on the 27th, as shown by the following reports: brig "Lilian," H. F. Schire, commanding, in N. 36° 58', W. 73° 5', barometer 29.93 (760.2), wind sw., force 3, squally; during the 27th the wind blew in squalls of great force from sw. to w., with rain, thunder and lightning, and occasional calms; this weather continued throughout the twenty-four hours. Captain Randall, commanding the ship "Dynomene," in N. 37° 0', W. 73° 6', reported barometer 29.89 (759.2), wind wsw., force 3; 4 p. m., barometer 29.78 (756.4), heavy squalls of wind, rain, and thunder and lightning. The bark "Levanter," A. F. Vesper, commanding; in N. 38° 0', W. 74° 40', reported barometer 29.83 (757.7), a fall of .13 inch, wind sse., force 2, cloudy.

On the 28th, the disturbance was near N. 40°, W. 65°; the schooner "Arthur Burton," W. E. Crockett, commanding, reported: in N. 42°, W. 70° 15', barometer 29.75 (755.6), wind nne., force 4, threatening; bark "Diamant," L. Haesloop, commanding, in N. 40° 30', W. 67° 51', barometer 29.79 (756.6), wind wsw., force 5, overcast; s. s. "Gallia," M. Murphy, commanding, in N. 40° 33', W. 68° 7', reported barometer 29.52 (749.8), wind n., force 2, fair. The disturbance moved east-northeastward during the day, and was encountered by the s. s. "Greece," when between N. 41° 10', W. 56° 9', and N. 40° 59', W. 61° 23'. Captain W. Tyson, commanding that vessel, reported as follows: 28th, 11 hrs. 56m., moderate sw. gale, heavy rain, and sea from sw., barometer 29.75 (755.6); 16 hrs., wind hauling to westerly, with rain-squalls and rising nw. sea, barometer 29.7 (754.4); 20 hrs. 3 m., wind nnw., heavy cross sea, weather breaking, barometer 29.8 (756.9).

On the 29th, the region of low pressure was near N. 42°, W. 52°, where the lowest barometer reading was 29.62 (752.3), wind ese. force 3, raining; on the sixtieth meridian the wind was n. and nw. blowing with the force of a moderate gale. On the 30th the disturbance was central near N. 45° W. 35° attended by light easterly winds between N. 45° and 50° and barometer ranging from 29.7 (754.4) to 29.9 (759.4). By the 31st it had reached N. 50°, W. 29°; the winds between W. 40° and 30°, had now changed to n. and w. but they did not exceed the force of a strong breeze. The s. s. "Rhyndland," J. C. Jamison, commanding, in N. 47° 40', W. 29° 59' reported barometer 29.85 (758.2), wind se. to n. and nw., moderate gale, high sea.

OCEAN ICE.

Chart i. also exhibits the southern and eastern limits of the region within which icebergs were observed in the north Atlantic ocean during the period from July 8th to August 8th, 1884. These limits are determined from reports sent by shipmasters to this office; reports furnished through the co-operation of the "New York Herald Weather Service," and from other data published in the "New York Maritime Register."

For the above-mentioned period the southern limit of the ice-region was somewhat to the northward of 46° north latitude, the southernmost iceberg having been seen in N. 46° 24'. The eastern limit was near W. 46°.

Compared with the chart for the preceding month (June), a very marked difference is shown in the position of the southern limit of the ice-region. From July 8th to the close of the month no icebergs had been reported south of the forty-sixth parallel, while in the preceding month they were reported as far south as N. 40° 40', thus showing a difference of more than five degrees of latitude. As regards the eastern limit, it is only about 30' west of that for June.

A comparison with the chart for the corresponding month in 1883 shows that the southern limit in July of that year was about 4° farther south, and the eastern limit about 1° to the eastward of those for the present month.

A comparison with the chart for the same month in 1882 shows the limits of the ice region in that year to have been about 6° to the southward and about the same distance to the eastward of the limits as determined for July, 1884.

The following reports have been received up to August 20th: July 6th.—Bark "Fluorine" met pack ice in N. 57° 38', W. 45° 21'.

8th.—Capt. G. S. Dale, commanding the s. s. "Brooklyn," reported: "Straits of Belle Isle full of large icebergs; numerous icebergs in the vicinity of Belle Isle. The last berg was seen in N. 52° 41', W. 51° 5'."

9th.—Captain Wilson, of the bark "Fluorine," reported: "working the ship through heavy ice in N. 60° 3', W. 48° 14'."

15.—S. S. "Eider," in N. 47° 6', W. 48° 0', passed an iceberg about eighty-seven feet high; also, in N. 46° 24', W. 50° 2', passed a small berg about five miles to the northward.

18th.—S. S. "State of Nebraska," in N. 47° 25', W. 47° 10', passed two icebergs, one of them being very large.

21st.—S. S. "Edam," in N. 46° 30', W. 46° 45', passed an iceberg.

23d.—Captain Wilson of the bark "Fluorine," reported in N. 60° 42', W. 50° 2' "working out through heavy ice."

24th.—Ship "America," in N. 46° 30', W. 46° 30', passed a small iceberg. Captain Bernson, commanding the s. s. "Lake Huron," reported: "Passed numerous large and small icebergs from one hundred and forty miles east of Belle Isle to the eastern entrance to the Straits, then encountered numerous bergs of great magnitude, almost blocking the entrance of the Straits; also passed many icebergs about twenty miles west of Greenlet Island."

25th.—Captain W. P. Couch, commanding the s. s. "Ontario," reported: "Many icebergs in the Straits of Belle Isle; saw a large berg in N. 52° 40' W. 52° 25', and many bergs thence to N. 50° 0', W. 59° 30'."

27th.—S. S. "March," in N. 47° 24' W. 46° 35', passed five large icebergs.

28th.—S. S. "Ludgate Hill," in N. 48° 36', W. 46° 28', passed an iceberg.

29th.—S. S. "Ludgate Hill," in N. 47° 14', W. 50° 37', passed an iceberg, also in N. 46° 58', W. 50° 42', passed another, and several between that and Cape Race.

30th.—S. S. "Lord Gough," in N. 48° 3', W. 47° 16', passed two small icebergs.

31st.—S. S. "City of Rome," in N. 47° 50', W. 49° 35', passed an iceberg. Captain Dale, of the s. s. "Brooklyn," reported: "Saw the first ice about four miles east of Belle Isle, one very large berg about two miles east of it. The Straits were full of icebergs and detached pieces."

August 2d.—S. S. "Critic," at New York, reported having passed several icebergs on the coast of Newfoundland.

4th.—S. S. "Celtic," in N. 47° 20', W. 47° 3', passed an iceberg.

8th.—S. S. "Circassia," in N. 47° 10', W. 46° 59', passed a large iceberg.

TEMPERATURE OF THE AIR.

[Expressed in degrees, Fahrenheit.]

The distribution of mean temperature over the United States and Canada for July, 1884, is exhibited on chart ii. by the dotted isothermal lines.

In the following table are shown the normal temperatures for July; the mean temperatures for July, 1884, and the departures from the normal for each of the several geographical districts, as deduced from the records of the Signal Service:

Average temperatures for July, 1884.

Districts.	Average for July, Signal-Service observations.		Comparison of July, 1884, with the average for several years.
	For several years.	For 1884.	
New England.....	69.3	66.3	3.0 below.
Middle Atlantic states.....	75.5	72.9	2.6 below.
South Atlantic states.....	80.6	79.7	0.9 below.
Florida peninsula.....	83.2	83.5	0.3 above.
Eastern Gulf states.....	81.2	80.6	0.6 below.
Western Gulf states.....	82.5	83.7	1.2 above.
Rio Grande valley.....	85.3	85.6	0.3 above.
Tennessee.....	79.3	77.9	1.4 below.
Ohio valley.....	77.5	75.0	2.5 below.
Lower lake region.....	71.0	66.8	4.2 below.
Upper lake region.....	67.7	63.6	4.1 below.
Extreme northwest.....	67.8	63.1	4.7 below.
Upper Mississippi valley.....	75.8	73.0	2.8 below.
Missouri valley.....	74.3	74.8	0.5 below.
Northern slope.....	68.0	65.9	2.1 below.
Middle slope.....	74.7	75.9	1.2 above.
Southern slope.....	80.0	83.7	3.7 above.
Southern plateau.....	81.8	82.8	1.0 above.
Northern plateau.....	70.8	67.4	3.4 below.
North Pacific coast region.....	64.8	62.7	2.1 below.
Middle Pacific coast region.....	71.4	69.9	1.5 below.
South Pacific coast region.....	75.9	76.4	0.5 above.
Mount Washington, N. H.....	47.9	44.6	3.3 below.
Pike's Peak, Colo.....	40.3	39.8	0.5 below.
Salt Lake City, Utah.....	76.3	73.4	2.9 below.

A comparison of the mean temperatures for July, 1884, with the average for the corresponding months, shows the former to have been unusually cool over the greater part of the United States. In southern Florida; along the immediate California coast, south of San Francisco; in southeastern Arizona; and from New Mexico eastward to the lower Mississippi valley, except along the Texas coast from Indianola to the mouth of the Rio Grande river (where there was a slight deficiency), the reports for July, 1884, show that the mean temperature was higher than the average. In the districts above mentioned the departures above the normal were greatest from western Texas to southeastern Arizona, where they were from 4° to 5°. Throughout the northern sections of the country the mean temperatures were everywhere below the average, the departures being most marked from northeastern California to western Montana, and from Dakota eastward to southern New England and the northern portion of the middle Atlantic states, where they ranged from 4° to 6°. Along the immediate coast, from southern New Jersey to Northern Florida, and in Georgia and Alabama, the departures were less than 2°.

The following are some of the highest and lowest monthly mean temperatures reported from the Signal Service stations:

Stations reporting highest.	Stations reporting lowest.
Fort McDowell, Arizona..... 90.8	Pike's Peak, Colorado..... 39.8
Yuma, Arizona..... 90.6	Mount Washington, New Hampshire... 44.6
Rio Grande City, Texas..... 88.4	Port Angeles, Washington Territory... 50.8
Phoenix, Arizona..... 87.7	Eastport, Maine..... 58.6
Shreveport, Louisiana..... 86.2	Fort Canby, Washington Territory..... 58.6
El Paso, Texas..... 85.5	Fort Maginnis, Montana..... 58.6
Fort Concho, Texas..... 85.3	Marquette, Michigan..... 59.9
New Orleans, Louisiana..... 85.3	San Francisco, California..... 60.0
Galveston, Texas..... 85.2	Saint Vincent, Minnesota..... 60.8
Fort Stockton, Texas..... 85.1	Olympia, Washington Territory..... 61.2
Fort Still, Indian Territory..... 85.1	Mackinaw City, Michigan..... 61.3
Key West, Florida..... 85.0	Fort Shaw, Montana..... 61.6
Indianola, Texas..... 83.5	Deadwood, Dakota..... 62.2

DEVIATIONS FROM MEAN TEMPERATURE.

The departures exhibited by the reports from the regular Signal Service stations are shown in the table of comparative temperatures for July, 1884. Voluntary observers report the following notes in connection with this subject:

Arkansas.—Lead Hill, Boone county: mean temperature, 81° 6, is 4° 2 above the July average of the last two years.

Mount Ida, Montgomery county: mean temperature, 80° 3, is 0° 3 above the July average of the last twelve years.

California.—Princeton, Colusa county: the mean of the maximum temperatures for July, 1884, is 89° 1, or 5° 1 below the average for the last twelve years.

College City, Colusa county: the summer of 1884, up to July 31st, has been the coolest experienced here for more than twenty years, the temperature having reached 100° on only one day.

Dakota.—Webster, Day county: mean temperature, 73° 1, is 1° 5 below the July average of the two preceding years.

Illinois.—Anna, Union county: mean temperature, 77° 7, is 1° 2 below the July average of the last nine years.

Riley, McHenry county: mean temperature, 67° 4, is 3° 2 below the July average of the last twenty-three years; in only two years of the above period has the month of July been colder, viz: in 1865 and 1882; and in only two years have the maximum temperatures been lower, viz: in 1869 and 1882.

Swanwick, Perry county: mean temperature, 75° 5, is 1° 1 below the July average of the last three years.

Mattoon, Coles county: mean temperature, 74° 4, is 4° 1 below the July average of the four preceding years.

Indiana.—Vevay, Switzerland county: mean temperature, 74° 8, is 4° below the July average of the last twenty years; the maximum temperature, 90°, is 5° 7 below the average, and the minimum, 54°, is 5° 9 below.

Wabash, Wabash county: mean temperature, 73° 2, is 1° below the July average of the last eight years.

Logansport, Cass county: mean temperature, 72° 5, is 5° 1 below the July average of the last twenty-five years. The extremes for July, 1884, are: maximum, 89°; minimum, 52°; the July extremes for twenty-five years are: maximum, 106° in 1874; minimum, 46° in 1863.

Iowa.—Iowa City, Johnson county: mean temperature for July, 1884, is 2° below the normal.

Kansas.—Independence, Montgomery county: mean temperature, 78° 3, is 1° 1 below the July average of the last thirteen years.

Yates Center, Woodson county: mean temperature, 78° 7, is 2° 1 above the average of the last four years.

Wellington, Sumner county: mean temperature, 78° 4, is 1° 1 above the July average of the last six years.

Maine.—Gardiner, Kennebec county: mean temperature, 65° 0, is 3° 7 below the July average of the last forty-eight years, and is the lowest July mean recorded during the above period.

Maryland.—Fallston, Harford county: mean temperature, 71° 0, is 4° 5 below the July average of the last ten years, and is the lowest July mean of that period, the next lowest being 73° 6 for July, 1882.

Massachusetts.—Worcester, Worcester county: mean temperature, 64° 5, is 8° 1 below the July average of the last forty-five years, and is the lowest July mean for that period, the next lowest being 66° 3 for 1860, and the highest, 78° 1 for 1850. The extremes for July, 1884, are: maximum, 82°; minimum, 51°; the extremes for July of the last forty-five years being 95° (maximum) in 1849; and 48° (minimum) in 1845, 1849, and 1851.

Missouri.—Saint Louis: mean temperature, 77° 6, is 1° 6 below the normal.

New Hampshire.—Contoocook, Merrimack county: mean temperature, 69° 4, is about 1° below the normal for July.

New Jersey.—Paterson, Passaic county: mean temperature, 70°, is the lowest July mean of the last ten years.

South Orange, Essex county: mean temperature, 69° 3, is 4° 1 below the July average of the last fourteen years.

New York.—Palermo, Oswego county: mean temperature, 62° 9, is 6° 6 below the July average for the last thirty-one years.

North Volney, Oswego county: mean temperature, 64° 9, is 4° 7 below the average for July of the last seventeen years, and is the lowest July mean for that period, the highest being 76° 2 for 1868.

Ohio.—Wauseon, Fulton county: mean temperature, 70° 1, is 2° 5 below the July average of the last fourteen years.

Table of maximum and minimum temperatures for July, 1884.

State or Territory.	Signal Service.			U. S. Army Post Surgeons, or Voluntary Observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
Alabama	Mobile	95	70	Troy	104	69
Do	Montgomery	95	66	Selma	94	54
Arizona	Fort McDowell	116	62	Texas Hill	118	70
Do	Fort Apache	102	47	Benson	108	70
Arkansas	Fort Smith	104	65	Lead Hill	105	62
Do	Little Rock	101	68	Monticello	100	50
California	Los Angeles	99	52	Mammoth Tank	126	78
Do	Fort Bidwell	97	36	Summit	72	38
Colorado	West Las Animas	104	52	Fort Lyon	104	52
Do	Pike's Peak	54	28	Fort Collins	102	61
Connecticut	New Haven	87	54	Hartford	95	54
Do	New London	83	55	Southington	94	54
Dakota	Fort Bennett	97	50	Morrison	95	50
Do	Bismarck	89	32	Fort Buford	95	38
Delaware	Del. Breakwater	86	60			
District of Columbia	Washington City	96	56	Rock Creek bridge	99	64
Florida	Pensacola	97	69	Live Oak	99	63
Do	Jacksonville	96	69	Saint Augustine	93	63
Georgia	Savannah	96	68	Athens	106	64
Do	Atlanta	90	65	Gainesville	92	47
Idaho	Lewiston	94	49			
Do	Coeur d'Alene	88	29			
Illinois	Cairo	92	67	McLeansborough	98	57
Do	Chicago	89	54	Aurora	94	50
Indiana	Indianapolis	90	55	Sumner	98	54
Indian Territory	Fort Sill	107	65	Spice-land	93	47
Do	Fort Reno	105	58			
Iowa	Des Moines	95	55	Logan & Manchester	96	54
Do	Davenport	88	50	Monticello	92	50
Kansas	Leavenworth	101	58	Wellington	105	57
Do	Dodge City	98	58	Westmoreland	98	51
Kentucky	Louisville	94	62	Bowling Green	91	55
Do				Richmond	93	62
Louisiana	Shreveport	104	72	Minden	100	65
Do	New Orleans	95	71	Opelousas	104	62
Maine	Portland	87	55	Cornish	92	55
Do	Eastport	81	45	Gardiner	83	48
Maryland	Baltimore	85	60	Great Falls	94	50
Do	Ocean City	88	54	Woodstock	93	49
Massachusetts	Boston	90	54	Westborough	95	55
Do	Thatcher's Island	82	53	Sunderet	94	46
Michigan	Detroit	89	51	Mendon	97	45
Do	Marquette	86	43	Fort Brady	83	37
Minnesota	Saint Paul	88	52	Hastings	98	46
Do	Saint Vincent	83	41	Northfield	88	44
Mississippi	Vicksburg	99	70	Okolona	104	64
Do				Monroe	99	63
Missouri	Saint Louis	94	65	Harrisonville	103	66
Do				Conception	93	55
Montana	Poplar River	93	40			
Do	Fort Shaw	85	38	Red Willow	100	50
Nebraska	Omaha	97	58	Fremont	98	50
Do	North Platte	97	54	Winnemucca	105	70
Nevada				Hot Springs	95	32
New Hampshire	Mount Washington	67	30	Contoocook	93	44
New Jersey	Little Egg Harbor	90	55	Salem City	97	65
Do	Atlantic City	50	57	South Orange	96	58
New Mexico	Fort Craig	107	70	Puerto de Luna	105	72
Do				Fort Union	95	47
New York	New York City	90	57	Ardens	95	49
Do	Rochester	89	48	Madison Barracks	90	44
North Carolina	Kitty Hawk	97	62	Lumberton	100	59
Do	Scott's Hill	93	60	Salisbury	100	51
Ohio	Sandusky	91	57	Jacksonborough	100	54
Do	Cleveland	86	54	Lebanon	94	41
Oregon	Roseburg	86	43	East Portland	86	32
Do	Ashland	100	42	Bandon	69	46
Pennsylvania	Pittsburg	97	52	Easton	96	61
Do	Philadelphia	92	59	Wellesborough	92	42
Rhode Island	Narragansett Pier	85	42			
Do	Point Judith	81	54			
South Carolina	Charleston	95	69	Anderson	104	61
Do				Cheraw	101	59
Tennessee	Chattanooga	92	61	Hohenwald	99	56
Do	Nashville	94	64	Andersonville	94	46
Texas	El Paso	111	60	Corsicana	105	57
Do	Fort Elliott	99	62	Dallas	105	68
Utah	Salt Lake City	93	54	Promontory	105	60
Do	Fort Thornburg	104	45	Blue Creek	98	39
Vermont				Charlotte	93	53
Do				Dorset	86	39
Virginia	Lynchburg	96	57	Acetank	100	64
Do	Cape Henry	96	62	Wytheville	87	45
Washington Territory	Dayton	96	44	Phasant Grove	91	43
Do	Port Angeles	73	41	Bainbridge Island	80	50
West Virginia				Helvetia	92	42
Wisconsin	La Crosse	91	55	Beloit	90	49
Do	Milwaukee	90	54	Neillsville	82	39
Wyoming	Cheyenne	90	44	Fort Bridger	86	39
Do	Fort Bridger	89	30	Fort Fred Steele	93	32

Pennsylvania.—Wellsborough, Tioga county: month remarkable for its low mean temperature, which is 66° 7, or 4° 2 below the July average of the last twenty years.

Dyberry, Wayne county: mean temperature, 65° 2, is 3° below the July average of the last seventeen years.

Texas.—New Ulm, Austin county: mean temperature, 84° 2, is 1° 5 above the July average of the last thirteen years.

Vermont.—Woodstock, Windsor county: mean temperature, 66°.0, is 2°.0 below the average of the last seventeen years. The extreme monthly means for that period are: highest, 71°.3, for 1878; lowest, 64°.3, for 1869.

Virginia.—Wytheville, Wythe county: mean temperature, 69°.9, is 2°.3 below the July normal for a period of twenty years.

Variety Mills, Nelson county: mean temperature, 72°.7, is 3°.5 below the July average of the last seven years.

West Virginia.—Helvetia, Randolph county: mean temperature, 66°.6, is 3°.6 below the July average for the last eight years.

MONTHLY RANGES OF TEMPERATURE.

The monthly ranges of temperature were greatest in the Rocky mountain districts and in the extreme northwest; they were least along the Pacific, Atlantic, and Gulf coasts, and in the central and lower Mississippi valleys; they varied in

Table of comparative maximum temperatures for the month of July.

State or Territory.	Maximum for July, 1884, Signal Service.		Maximum since Signal-Service stations were opened—3 to 13 years.			Highest from any other source.			
	Station.	Temperature.	Station.	Temperature.	Year.	Place.	Temperature.	Year.	Length of record.
Alabama	Montgomery	95	Montgomery	107	1881	Mount Vernon Arsenal	100	1881	Years.
Do	Mobile	96	Mobile	101	1881	Mobile	98	1873	33
Arizona	Yuma	112	Yuma	118	1878	Fort Mojave	118	1870, 1873	24
Do	Fort McDowell	110	Stanwix	116	1877	Camp Grant	116	1871	14
Arkansas	Little Rock	101	Little Rock	100	1879, 1881	Washington (near)	103	1860	28
Do	Fort Smith	104	Fort Smith	100	1882, 1883	Fort Smith	105	1860	21
California	Red Bluff	99	Red Bluff	110	1879	Fort Yuma	119	1877	34
Do	Los Angeles	98	Visalia	107	1879	Fort Miller	115	1871	13
Colorado	Denver	94	Denver	103	1874	Fort Lyon	108	'68, '69, '78	23
Do	Pike's Peak	87	Pike's Peak	64	1879	Fort Garland	97	1871	21
Connecticut	New Haven	83	New Haven	95	1879	New Haven	101	1871	88
Do	New London	83	New London	93	1876, 1878	Columbia	100	1860	10
Dakota	Fort Bennett	97	Fort Sully	109	1877	Fort Sully	114	1871	17
Do	Fort Buford	93	Fort Buford	104	1881	Fort Randall	107	1865	14
Delaware	Delaware Breakwater	86	Delaware Breakwater	101	1880	Fort Delaware	101	1865	45
District of Columbia	Washington City	96	Washington City	103	1879	Washington City	103	1838	49
Florida	Jacksonville	96	Jacksonville	104	1879	Fort King	103	1860	10
Do	Key West	94	Key West	100	1879	Fort Barrancas	100	1860	52
Georgia	Augusta	94	Augusta	105	1878	Forsyth	106	1881	7
Do	Savannah	92	Savannah	105	1879	McPherson Barracks	107	1878	7
Idaho	Boise City	92	Boise City	109	1877	Fort Boise	113	1871	15
Do	Lewiston	94	Fort Lapwai	104	1877	Fort Lapwai	110	1864	10
Illinois	Cairo	92	Cairo	99	1874, 1881	Chicago	106	1868	39
Do	Springfield	90	Springfield	102	1879	Springfield	103	1863	5
Indiana	Indianapolis	90	Indianapolis	101	1881	Wabash	104	1876	13
Do	Indianapolis	90	Indianapolis	101	1881	Spiceburg	100	1864, 1861	13
Indian Territory	Fort Reno	105	Fort Gibson	109	1879	Fort Sill	109	1871	10
Do	Fort Sill	107	Fort Sill	106	1881	Fort Arbuckle	109	1860	20
Iowa	Dubuque	92	Dubuque	101	1874	Fort Madison	105	1870	20
Do	Keokuk	93	Keokuk	100	1874	Brookside	105	1868	5
Kansas	Dodge City	97	Dodge City	108	1876	Fort Larned	115	1871	15
Do	Leavenworth	97	Leavenworth	104	1874	Fort Riley	111	1860	20
Kentucky	Louisville	97	Louisville	104	1874	Newport Barracks	95	1860	29
Louisiana	Shreveport	104	Shreveport	107	1875	Baton Rouge	102	1877, 1878	57
Do	New Orleans	95	New Orleans	96	1875	New Orleans	100	1840, 1841	51
Maine	Portland	87	Portland	97	1876	Brunswick	102	1869	53
Do	Eastport	81	Eastport	97	1880	Fort Preble	101	1881	60
Maryland	Baltimore	95	Baltimore	99	'76, '79, '80	Fort Washington	102	1871	46
Do	Ocean City	88	Boston	103	1880	Fort McHenry	102	1879	51
Massachusetts	Boston	90	Boston	103	1880	Westborough	103	1870	10
Do	Thatcher's Island	82	Springfield	94	1876, 1879	Fort Warren	100	1872	19
Michigan	Detroit	89	Detroit	100	1878	Marquette	103	1862	9
Do	Marquette	86	Marquette	100	1878	Monroe	103	1866	11
Minnesota	Saint Paul	88	Saint Paul	100	1883	Fort Ripley	103	1871	16
Do	Moorhead	83	Breckenridge	97	1878	Fort Snelling	100	1838	62
Mississippi	Vicksburg	99	Vicksburg	100	1878, 1881	Brookhaven	102	1880	7
Do	Vicksburg	99	Starkville	91	1882	Meridian	104	1882	1
Missouri	Saint Louis	94	Springfield	99	1882	Alton	109	1868	4
Do	Saint Louis	94	Saint Louis	104	1881	Saint Louis	103	1872	38
Montana	Fort Keogh	93	Fort Keogh	109	1881	Fort Shaw	112	1872	13
Do	Fort Benton	90	Fort Benton	107	1881	Fort Benton	105	1870	4
Nebraska	North Platte	97	North Platte	107	1877	Fort McPherson	115	1870	15
Do	Omaha	97	Omaha	105	1874	Fort Calhoun	108	1862	5
Nevada	Winnemucca	104	Winnemucca	104	1877	Camp Halleck	110	1870	11
New Hampshire	Mount Washington	67	Mount Washington	73	1881	Stratford	100	1868	11
New Jersey	Sandy Hook	90	Sandy Hook	100	1876	Haddonfield	102	1866	7
Do	Atlantic City	90	Atlantic City	99	1880	Paterson	99	1866	6
New Mexico	Fort Craig	107	La Mesilla	107	1880, 1882	Fort McRae	110	1873	10
Do	Fort Craig	107	Fort Bayard	115	1882	Fort Craig	112	1867	29
New York	Oswego	88	Oswego	100	1878	Newburg	105	1849	40
Do	New York City	90	New York City	99	1876	Fort Columbus	104	1821	61
North Carolina	Wilmington	94	Wilmington	103	1879	Weldon	107	1879	9
Do	Charlotte	93	Charlotte	101	1879	Fort Johnson	104	1831	57
Ohio	Cincinnati	91	Cincinnati	103	1874, 1881	Jacksonburg	104	1881	8
Do	Columbus	89	Columbus	103	1881	Marietta	102	1859	54
Oregon	Portland	84	Unstilla	107	1880	Fort Dalles	105	1853	15
Do	Roseburg	86	Roseburg	97	1880	Fort Hoskins	101	1868	8
Pennsylvania	Pittsburg	97	Pittsburg	103	1881	Carlisle Barracks	105	1868	35
Do	Philadelphia	92	Philadelphia	100	1876	Mount Joy	103	1867	10
Rhode Island	Narragansett Pier	85	Newport	92	1878	Fort Adams	102	1867	41
South Carolina	Charleston	95	Charleston	104	1879	Charleston	101	1752	105
Tennessee	Chattanooga	92	Chattanooga	101	1879	Castalian Springs	103	1875	3
Do	Nashville	94	Nashville	101	'74, '79, '81	Glenwood Cottage	99	1860	11
Texas	El Paso	111	Eagle Pass	112	1881	Fort Mason	114	1860	9
Do	Rio Grande City	110	Laredo	110	1879	Camp Stockton	111	1860	16
Utah	Salt Lake City	93	Salt Lake City	98	1877	Camp Douglas	103	1860	20
Do	Fort Thornburg	104	Burlington	96	1878	Mount Carmel	112	1877	3
Vermont	Norfolk	96	Norfolk	102.5	1876	Randolph	102	1868	5
Virginia	Lynchburg	96	Lynchburg	102	1881	Dover Mines (near)	104	1879	3
Do	Spokane Falls	91	Almont	105	1882	Fortress Monroe	101	1851	57
Washington Territory	Dayton	96	Dayton	102	1880	Fort Walla Walla	107	1859, 1860	13
West Virginia	Morgantown	97	Morgantown	97	1874	Cape Disappointment	104	1865	9
Wisconsin	La Crosse	91	La Crosse	101	1874	Flemington	98	1881	14
Do	Milwaukee	90	Milwaukee	95	1874, 1878	Embarras	104	1866	15
Wyoming	Cheyenne	90	Cheyenne	100	1881	Fort Winnebago	104	1838	15
						Fort Laramie	107	1876	27

extremes from 18° at Key West, Florida, and 19° at Fort Macon, North Carolina, and Galveston, Texas, to 59° at Cœur d'Alene, Idaho, Fort Thornburg, Utah, and Phoenix, Arizona, and to 60° at Fort Bidwell, California, and Wickenburg, Arizona.

The following stations report monthly ranges of 50° or more: Fort Custer and Poplar River, Montana, and San Carlos, Arizona, 50°; Fort Thomas, Arizona, and Fort Benton, Montana, 51°; Dayton, Washington Territory, and West Las Animas, Colorado, 52°; Fort McDowell, Arizona, 54°; Willcox, and Forts Apache, and Verde, Arizona, 55°; Bismarck, Dakota, 57°; Fort Buford, Dakota, and Fort Bridger, Wyoming, 58°; Cœur d'Alene, Idaho, Fort Thornburg, Utah, and Phoenix, Arizona, 59°; Fort Bidwell, California, and Wickenburg, Arizona, 60°.

Monthly ranges of 27° and less occurred at the following stations: Key West, Florida, 18°; Fort Macon, North Carolina, and Galveston, Texas, 19°; Brownsville, Texas, and Cedar Keys, Florida, 21°; Fort Canby, Washington Territory, Indianola, Texas, and Hatteras, North Carolina, 22°; Fort Smith, Arkansas, and New Orleans, Louisiana, 23°; Block Island, Rhode Island, 24°; Atlanta, Georgia, and Cairo, Illinois, 25°; Pike's Peak, Colorado, Charleston, South Carolina, and Mobile, Alabama, 26°. Cape May, New Jersey, Jacksonville, Florida, Point Judith, Rhode Island, and Wilmington, North Carolina, 27°.

GREATEST DAILY RANGES OF TEMPERATURE.

The greatest daily ranges of temperature varied in the several districts as follows:

New England.—From 16° at Block Island, Rhode Island, on the 3d and 16th, to 29° at Eastport, Maine, on the 3d.

Middle Atlantic states.—From 19° at Delaware Breakwater, Delaware, on the 22d, to 30° at Washington City, District of Columbia, on the same date.

South Atlantic states.—From 15° at Fort Macon and Hatteras, North Carolina, on the 7th and 10th, respectively, to 25° at Kitty Hawk, North Carolina, on the 25th.

Florida peninsula.—From 15° at Key West on the 26th, to 19° at Cedar Keys on the 6th.

East Gulf states.—From 19° at New Orleans, Louisiana, on the 26th, to 26° at Vicksburg, Mississippi, on the 12th.

West Gulf states.—From 15° at Galveston, Texas, on the 10th to 35° at Fort Smith, Arkansas, on the 11th.

Rio Grande valley.—From 21° at Brownsville, Texas, on the 21st, to 34° at Rio Grande City, Texas, on the same date.

Tennessee.—From 24° at Nashville, on the 22d, to 27° at Knoxville, on the same date.

Ohio valley.—From 23° at Cincinnati, Ohio, on the 22d, to 37° at Pittsburg, Pennsylvania, on the same date.

Lower lake region.—From 24° at Rochester, New York, Erie, Pennsylvania, Toledo, Ohio, and Oswego, New York, on the 1st, 11th, 22d, and 30th, respectively, to 37° at Sandusky, Ohio, on the 22d.

Upper lake region.—From 19° at Grand Haven, Michigan, on the 18th, to 29° at Escanaba, Michigan, on the 20th.

Extreme northwest.—From 31° at Moorhead and Saint Vincent, Minnesota, on the 9th and 19th, respectively, to 40° at Fort Buford, Dakota, on the 9th.

Upper Mississippi valley.—From 22° at Cairo, Illinois, and Saint Louis, Missouri, on the 5th and 12th, respectively, to 30° at Dubuque, Iowa, on the 10th.

Missouri valley.—From 29° at Omaha, Nebraska, and Yankton, Dakota, on the 10th and 21st, respectively, to 38° at Fort Bennett, Dakota, on the 25th.

Northern slope.—From 30° at Deadwood, Dakota, on the 9th, to 47° at Forts Benton and Shaw, Montana, on the 5th.

Middle slope.—From 21° on the summit of Pike's Peak, Colorado, on the 26th, and 22° at Dodge City, Kansas, on the 6th, to 46° at West Las Animas, Colorado, on the 4th.

Southern slope.—From 37° at Fort Sill, Indian Territory, and Fort Concho, Texas, on the 11th, to 38° at Fort Stockton, Texas, on the 30th.

Southern plateau.—From 27° at Fort Grant, Arizona, on the 4th, to 49° at Fort Apache, Arizona, on the 26th.

Middle plateau.—32° at Salt Lake City, Utah on the 5th.

Northern plateau.—From 33° at Boise City, Idaho, on the 27th, to 40° at Dayton, Washington Territory, on the 25th.

North Pacific coast region.—From 18° at Fort Canby, Washington Territory, on the 26th, to 35° at Roseburg, Oregon, and Olympia, Washington Territory, on the 8th and 13th, respectively.

Middle Pacific coast region.—From 24° at San Francisco, California, on the 10th, to 38° at Red Bluff, California, on the 31st.

South Pacific coast region.—From 21° at San Diego, California, on the 10th, to 42° at Los Angeles, California, on the 1st.

FROSTS.

Frosts occurred during July, as follows:

California.—Blue Lake, 7th.

Colorado.—On the summit of Pike's Peak, 20th, 25th, 26th.

Dakota.—Fort Totten, 1st, 12th.

Montana.—Fort Maginnis: reports from Maidenville state that ice formed to a thickness of one-eighth inch, and that a killing frost occurred at that place on the 5th. Maidenville is five miles distant from, and its altitude about eight hundred feet above Fort Maginnis.

Nevada.—Carson City, 4th, 16th, 18th, 19th, 20th.

New Hampshire.—Dover: a heavy frost occurred in Latham during the night of the 25-26th, which seriously injured the crops.

Petersborough: there was considerable frost in the low lands on the morning of the 26th, which caused injury to beans and other vegetables.

Frosts occurred on the summit of Mount Washington on the 25th, 26th, and 29th.

Pennsylvania.—Troy, 8th, 17th; Wellsborough, 15th.

Vermont.—Woodstock, 26th.

The following extract is from the "Canadian Weather Review" for July, 1884:

Sharp frosts are reported from the eastern part of Ontario, at Ennismore, on the 21st; at L'Amable and Denbigh on the 25th; and at Shoal Lake, Manitoba, potatoes are reported to have been cut down by frost on the 1st.

PRECIPITATION.

[Expressed in inches and hundredths.]

The distribution of rainfall over the United States and Canada, as determined by the reports from nearly eight hundred stations, is exhibited on chart iii.

A comparison of the precipitation for July 1884, with the average for the corresponding month for a series of years shows deficiencies in the following districts: upper lake region, Ohio valley, western Tennessee, and, with the exception of a few localities, in all of the southern districts. From Arizona eastward to the Mississippi river the deficiencies at numerous stations exceeded three inches, and owing to the unusually small precipitation in those districts, severe drought prevailed. While the average precipitation for the east Gulf states, as shown in the table, is about normal, it was unevenly distributed, being deficient over Alabama and Georgia and excessive in the vicinities of Pensacola, Florida; Vicksburg, Mississippi; and Chattanooga, Tennessee. The precipitation for July, 1884, exceeded the average in the following districts: eastern Tennessee; in the Atlantic coast states north of South Carolina; in the Arkansas and Missouri valleys; central and western Montana; central and southern Illinois; central Indiana; northeastern Ohio; and in western New York. The excess was greatest in the lower Missouri valley; New England; the middle Atlantic states; and in western Montana. On the summit of Mount Washington, New Hampshire, the precipitation for the month was 23.90, which is an excess of 14.08 over the average for July, and is the largest amount recorded in any month since observations were begun in September, 1871; the next largest being 23.41 for April, 1878.

The first column of the following table shows the average precipitation for the month of July in each of the various districts, as determined from Signal Service observations for a

series of years; in the second column are given the averages for July, 1884; and the third column shows the excess or deficiency of July, 1884, when compared with the average.

Average precipitation for July, 1884.

Districts.	Average for July, 1884.		Comparison of July, 1884, with the average for several years.
	For several years.	For 1884.	
	Inches.	Inches.	Inches.
New England.....	4.13	5.74	1.61 excess.
Middle Atlantic states.....	4.10	5.44	1.34 excess.
South Atlantic states.....	5.77	6.73	0.96 excess.
Florida peninsula.....	6.18	4.80	1.38 deficiency.
Eastern Gulf states.....	4.82	4.80	0.02 deficiency.
Western Gulf states.....	4.00	2.71	1.29 deficiency.
Rio Grande valley.....	2.25	0.11	2.14 deficiency.
Tennessee.....	3.92	4.71	0.79 excess.
Ohio valley.....	4.26	4.21	0.05 deficiency.
Lower lake region.....	3.85	3.93	0.08 excess.
Upper lake region.....	3.31	2.90	0.41 deficiency.
Extreme northwest.....	3.03	3.55	0.52 excess.
Upper Mississippi valley.....	4.05	4.51	0.46 excess.
Missouri valley.....	4.25	6.24	1.99 excess.
Northern slope.....	1.40	3.24	1.84 excess.
Middle slope.....	2.53	2.40	0.13 deficiency.
Southern slope.....	3.00	0.87	2.13 deficiency.
Southern plateau.....	2.42	0.34	2.08 deficiency.
Northern plateau.....	0.81	0.82	0.01 excess.
North Pacific coast region.....	0.59	0.82	0.23 excess.
Middle Pacific coast region.....	0.01	0.01	0.00 excess.
South Pacific coast region.....	0.08	0.01	0.07 deficiency.
Mount Washington, N. H.....	9.82	23.90	14.08 excess.
Pike's Peak, Colo.....	4.94	0.41	4.53 deficiency.
Salt Lake City, Utah.....	0.62	0.27	0.35 deficiency.

DEVIATIONS FROM AVERAGE PRECIPITATION.

The departures exhibited by the reports from the regular Signal Service stations are shown in the table of average precipitation for July, 1884. Voluntary observers report the following notes in connection with this subject:

Arkansas.—Lead Hill, Boone county: monthly precipitation, 5.04, is 4.96 below the July average for the two preceding years.

Connecticut.—Hartford, Hartford county: monthly precipitation, 5.98, is 0.98 in excess of the average for July.

Dakota.—Webster, Day county: monthly precipitation, 14.65, is unusually excessive, being 9.39 above the average for July for the two preceding years.

Illinois.—Mattoon, Coles county: monthly precipitation, 3.65, is 1.10 in excess of the average for the four preceding years.

Anna, Union county: monthly precipitation, 5.49, is 1.29 above the July average for the last nine years.

Riley, McHenry county: monthly precipitation, 4.19, is 0.16 above the July average of the last twenty-three years.

Swanwick, Perry county: monthly precipitation, 1.90, is 1.51 below the July average for the three preceding years.

Indiana.—Vevay, Switzerland county: monthly precipitation, 3.41, is 0.74 below the July average of the last twenty years.

Logansport, Cass county: monthly precipitation, 3.17, is 1.11 below the July average for the last twenty-five years.

Wabash, Wabash county: monthly precipitation, 4.79, is 1.59 above the July average for the last eight years.

Kansas.—Independence, Montgomery county: monthly precipitation, 5.77, is 1.46 above the July average for the last twelve years.

Yates Centre, Woodson county: monthly precipitation, 2.85, is 0.66 below the July average for the four preceding years.

Wellington, Sumner county: monthly precipitation, 1.89, is 1.98 below the July average for the last six years.

Fort Scott, Bourbon county: monthly precipitation, 10.76, is the largest amount that has fallen in any one month since August, 1880.

Maine.—Gardiner, Kennebec county: monthly precipitation, 5.17, is 1.76 in excess of the July average for a period of forty-eight years.

Maryland.—Fallston, Harford county: monthly precipitation, 3.57, is 0.09 below the July average for the last thirteen years.

Table of excessive and greatest monthly precipitation—July, 1884.

Station.	Specially heavy.		Largest monthly.	Amount.	Station.	Specially heavy.		Largest monthly.	Amount.
	Date.	Amt.				Date.	Amt.		
Alabama.					Maine.				
Green Springs.....	10	2.26	12.02		Eastport.....	9	2.40	8.48	
Do.....	25	2.17			Portland.....	9, 10	3.46	6.78	
Tuscaloosa.....	6	2.50	10.48		Maryland.				
Do.....	9	2.95			Baltimore.....	11	3.75	9.43	
Do.....	28	2.50			Fort McHenry.....	11	3.54	7.80	
Greensborough.....	27, 28	2.86	9.60		Ocean City.....	29	2.03	6.30	
Clanton.....	10, 11	3.75	9.00		McDonogh.....	2	2.45		
Do.....	25, 26	2.50			Cumberland.....	28	2.23		
Do.....	29	2.25			Michigan.				
Fayette.....			8.25		Traverse City.....	3	2.10		
Marion.....	31	3.50	8.19		Grand Haven.....	23	2.28		
Scottsborough.....	28	3.10	7.74		Minnesota.				
Evergreen.....	14, 15, 16	2.61	7.53		Moorhead.....	3, 4	3.58	7.32	
Dadeville.....	14, 15	2.38	7.53		Mississippi.				
Do.....	27, 28	2.25			Columbus.....	28	4.30	10.20	
Selma.....	28, 29	2.28	7.21		Waynesborough.....	18	2.15	6.98	
Eufaula.....	28, 29	3.03	6.63		Vicksburg.....	3	1.95		
Wetumpka.....	27, 28	5.00	6.50		Do.....	18	1.86		
Decatur.....	28	2.58	6.47		Aberdeen.....	28	2.99		
Tusculum.....	30, 31	2.16	6.11		Holly Springs.....	28	2.00		
Carrollton.....	28	3.50			Edwards.....	18	2.20		
Birmingham.....	29	2.47			Hernando.....	28	2.50		
Trinity.....	27	3.20			Missouri.				
Troy.....	14	2.00			Miami.....			14.17	
Arkansas.					Glasgow.....			10.95	
Mount Ida.....	27, 28	2.75			Springfield.....	19	2.30	9.22	
Fort Smith.....	27, 28	2.70			Do.....	27	3.10		
Lead Hill.....	15, 16	2.43			Dresden.....			7.37	
Connecticut.					Lexington.....			7.20	
Bethel.....			7.16		Ironton.....			7.00	
Voluntown.....			6.40		Sedalia.....			6.93	
New London.....			6.02		Mexico.....			6.75	
New Haven.....	19	2.08			Greenfield.....			6.60	
Hartford.....	28, 29	2.02			Oregon.....			6.35	
Dakota.					Boonville.....			6.31	
Webster.....	3	5.94	14.65		Conception.....	12, 13	2.05	6.12	
Do.....	14	2.08			Montana.				
Do.....	24, 25	2.70			Fort Assinaboine.....	16	3.27	9.67	
District of Columbia.					Do.....	24	1.53		
Distributing Reservoir.....	29, 30	3.08	8.03		Nebraska.				
Washington City.....	1	2.05	7.39		Ashland.....			11.79	
Do.....	27, 28, 29	2.07			Minden.....			11.60	
West Washington.....			6.30		Omaha.....	16, 17, 18	5.28	10.35	
Florida.					Fairburg.....			9.47	
Fort Barrancas.....	16	7.30	11.80		Fremont.....	18	2.40	9.03	
Pensacola.....	6	1.71	8.79		Do.....	24	2.21		
Do.....	16	2.23			Tecumseh.....	2, 3	2.70	9.03	
Archer.....	22	2.37	8.33		Central City.....			9.00	
Jacksonville.....	16	2.65	6.02		De Witt.....			8.70	
Cedar Keys.....	1, 2	3.03	6.02		Marquette.....	21	2.70	8.25	
Georgia.					De Soto.....	23, 24	2.00	7.87	
Smithville.....	12	7.50	11.85		Superior.....			7.87	
Albany.....	11	2.43	8.57		York.....			7.87	
Athen.....	4	4.02	7.02		Weeping Water.....			7.62	
Dalton.....	14	2.41	6.51		Rush.....			7.43	
Americus.....			6.25		Genoa.....	24	2.20	7.30	
Allapaha.....	11	3.27	6.23		West Point.....			7.18	
Illinois.					Red Willow.....	13	2.50	7.04	
Prairieville.....	8	2.00	10.60		Falls City.....			7.01	
Do.....	23	2.00			Table Rock.....			6.78	
Do.....	30	2.43			Keene.....			6.60	
Sycamore.....	23, 24, 25	4.05	8.84		Beaver Creek.....			6.34	
Cairo.....	5	2.16	7.34		New Hampshire.				
Do.....	30, 31	2.14			Mt. Washington.....	9, 10	3.19	23.90	
Sandwich.....	8, 9	2.68	7.06		Do.....	14 to 17	10.55		
Greenville.....			6.82		Do.....	19, 20, 21	4.12		
Polo.....	8	2.35	6.39		Do.....	23, 24	2.41		
Aurora.....			6.33		Weir's Bridge.....	23	2.04		
Rockford.....			6.13		New Jersey.				
Indiana.					Caldwell.....	4, 5	2.18	6.62	
Marengo.....			8.60		Paterson.....	5	2.30	6.46	
Clinton.....	24, 25	3.20	7.91		Sandy Hook.....	4, 5	2.00	6.42	
Worthington.....			7.87		Belvidere.....	4, 5	3.42	6.12	
Fillmore.....			7.11		Phillipsburg.....	4, 5	2.63		
Torre Haute.....	8, 9	2.08	7.11		Readington.....	5	2.50		
Indianapolis.....			6.03		Atlantic City.....	29	2.21		
Fort Wayne.....	30, 31	2.15			New York.				
Iowa.					West Point.....			8.40	
Logan.....	24	2.40	7.40		Mountainville.....	4, 5	2.20	7.72	
Des Moines.....	23, 24	2.23	7.16		White Plains.....	4, 5	3.05	7.65	
Independence.....	29	4.65	6.60		Fort Columbus.....	13, 14	2.20	7.20	
Dubuque.....	23	2.15			Madison Barracks.....	4, 5	2.40		
Ottumwa.....	24	2.00			New York City.....	12, 13	2.15		
Kansas.					North Carolina.				
Fort Scott.....	17	4.15	10.76		Kitty Hawk.....	6, 7	2.89	10.76	
W. Leavenworth.....	13, 14	3.10	9.50		Do.....	11	2.83		
Do.....	30	1.80			Hatteras.....	19	1.57	8.29	
Leavenworth.....	12, 13	4.30	9.43		Wilmington.....	1, 2	2.94	7.97	
Do.....	30, 31	3.18			Do.....	3	2.09		
Westmoreland.....	13, 14	2.75	8.50		Wadesboro.....	11	3.05	7.93	
Elk Falls.....			7.50		Charlotte.....	11	3.10	7.90	
Allison.....	15	2.21	6.64		Smithville.....	11	5.60	7.32	
Dodge City.....	9	2.05	6.40		Chapel Hill.....	26	2.02	6.63	
Do.....	16	2.13			Do.....	28	2.49		
Manhattan.....	14	2.45	6.33		North Carolina.				
Atchison.....	12, 13	3.20			Sidney.....			9.17	
Wyandotte.....	13	2.35			Halifax.....			8.29	
Salina.....	15	3.02			Ohio.				
Sterling.....	17	2.13			Junction.....			6.60	
Kentucky.					Warren.....			6.29	
Richmond.....	25	2.07	6.35		Garrettsville.....	29	2.43		
					Toledo.....	30, 31	2.03		
					Wauson.....	30, 31	2.85		

Table of excessive and greatest monthly precipitation—Cont'd—July, 1884.

Station.	Specially heavy.		Largest monthly amount.	Station.	Specially heavy.		Largest monthly amount.
	Date.	Amt.			Date.	Amt.	
<i>Ohio.</i> —Cont'd.				<i>Tenn.</i> —Cont'd.			
Cleveland.....	27	2.02		Hardison's Mills.....	28, 29	3.18	8.27
<i>Pennsylvania.</i>				Howell.....	30, 31	2.01	7.82
Wellsborough.....	25	2.95	8.67	Xenophon.....	7	2.30	7.00
Blooming Grove.....	27, 28	2.19	8.50	Do.....	23, 24	4.14	
Quakertown.....			7.92	Beach Grove.....	27, 28	2.42	7.54
Leetsdale.....	1	2.03	7.01	Henderson.....	26, 27	2.10	7.45
Do.....	29	2.00		Ashwood.....	7	2.20	7.00
Tamaqua.....			6.96	Hohenwald.....			6.83
Drifton.....			6.77	Centerville.....			6.74
Dyersburg.....			6.02	Flat Creek.....			6.55
Chambersburg.....		3.28		Savannah.....	25, 26	2.41	6.27
Philadelphia.....	5, 6	2.52		Kingston.....	31	3.30	6.20
Haverford College.....	5, 6	3.35		Hurricane Switch.....			6.26
<i>Quebec.</i>				Maryville.....	31	2.28	6.22
Quebec.....			6.70	Smithville.....			6.20
<i>Rhode Island.</i>				Dyersburg.....			6.12
Narragansett Pier.....	9	1.95	6.68	Riddleton.....	5	2.50	6.11
Block Island.....	27	1.84		Union City.....			
<i>South Carolina.</i>				Farmingdale.....	31	2.34	
Jacksonburg.....	12	2.55	11.28	<i>Texas.</i>			
Do.....	3, 4, 5	4.10		Fort Concho.....	17, 18	2.25	
Florence.....	4	2.58	9.61	<i>Virginia.</i>			
Charleston.....	11, 12	4.34	9.52	Accotink.....	21, 25	2.60	8.13
Saint George's.....	15	3.07	8.52	Do.....	28, 29	2.08	
Cheraw.....	4	2.10	8.34	Cape Henry.....	6	1.89	7.61
Do.....	11	3.03		Norfolk.....	6	2.04	7.06
Greenville.....	10, 11	2.26	7.35	Do.....	11	2.10	
Yemassee.....	12	2.60	6.88	<i>Wisconsin.</i>			
Allendale.....	19	2.20		Madison.....	3	2.10	8.44
<i>Tennessee.</i>				Do.....	23, 24	3.70	
Manchester.....	3	2.44	10.62	Embaras.....	23, 24	2.50	6.25
Do.....	27, 28	3.72		Neillsville.....	23	3.90	6.05
Knoxville.....	26, 27	2.04	8.90	Manitowoc.....	22	3.32	
Estill.....	25	2.30	8.67	Lancaster.....	23	2.79	
Milan.....	25	2.43	8.51	Sussex.....	23	2.10	
Do.....	25, 26	3.43		Franklin.....	24, 25	2.95	

Massachusetts.—Worcester, Worcester county: monthly precipitation, 4.07, is 0.51 in excess of the average for a period of forty-two years. The largest July precipitation occurring during the above period is 9.40 for July, 1855; the smallest, 0.43 for July, 1873.

Missouri.—Saint Louis: monthly precipitation, 2.94, is 1.22 below the July average for a period of forty-seven years.

New Hampshire.—Contoocook, Merrimack county: monthly precipitation, 2.00, is exactly one-half of the average amount for July at this place.

New Jersey.—Paterson, Passaic county: monthly precipitation, 6.46, is 2.18 in excess of the average for July.

South Orange, Essex county: monthly precipitation, 5.05, is 0.51 above the July average for the last fourteen years.

New York.—Palermo, Oswego county: monthly precipitation, 1.62, is 2.60 below the July average for the last thirty-one years.

North Volney, Oswego county: monthly precipitation, 2.50, is 1.12 below the July average of the last thirteen years.

Ohio.—Wauseon, Fulton county: monthly precipitation, 4.20, is 0.24 below the July average of the last twelve years.

Pennsylvania.—Dyberry, Wayne county: monthly precipitation, 6.02, is 0.93 above the July average of the last thirteen years.

Texas.—New Ulm, Austin county: no rain fell at this station during the entire month; the average July precipitation for the last thirteen years is 4.59. The present July is the first month, during the past thirteen years, in which no rain has fallen.

Vermont.—Woodstock, Windsor county: monthly precipitation, 2.36, is 1.65 below the July average for the last sixteen years.

Virginia.—Wytheville, Wythe county: monthly precipitation, 2.76, is 1.29 below the July normal.

Variety Mills, Nelson county: monthly precipitation, 3.96, is 0.79 above the July average for the last six years.

West Virginia.—Helvetia, Randolph county: monthly precipitation, 5.12, is 2.22 below the July average for the last eight years.

HAIL.

Dakota.—Plankinton, Aurora county: a destructive hail storm occurred at about 6 a. m. of the 11th; all windows on

the north side of buildings were broken. The storm started at a point about twelve miles northwest of Plankinton, and passed southeastward for a distance of about thirty miles. Nearly all of the grain in the storm's path was completely destroyed, many farmers losing their entire crops.

Huron: a destructive storm occurred in this vicinity between 1 and 2 p. m. of the 21st. The course of the storm was from northwest to southeast, its path being about eight miles in width near Huron, and increasing to about twice that width at Carthage, twenty-five miles distant. In the vicinity of Carthage the hail stones were of remarkable size and fell with a force sufficient to penetrate the roofs of buildings and to break ordinary weather boarding.

On the 23d a hail storm occurred in Hand, Spink, and Sully counties, which totally destroyed the crops, entailing losses estimated at \$50,000.

On the 25th a destructive hail storm occurred about thirty miles northwest of Huron, the track of the storm being one and one-half miles in width. Several small buildings and all of the standing grain in the storm's path were destroyed.

Fargo, Cass county: reports from Tower City, in this county, state that a destructive hailstorm occurred at 4 p. m. of the 25th. Several buildings were unroofed or blown down; about 1,000 window panes were broken. The crops in the vicinity of Tower City were ruined.

Grandin, Traill county: a heavy hail storm occurred in this vicinity on the 31st, ruining the crops and causing damage to buildings. This storm passed north of Glyndon where it was also very destructive.

Iowa.—Des Moines: reports from Webster City, Hamilton county, state that on the 11th a destructive hail storm occurred in that county. There were two storm clouds, one approached from the north-northwest, and the other from the northeast, which, after uniting, moved to the eastward. About one hundred farms in the townships of Cass, Blairsburg, Liberty and Rose Grove, suffered to a more or less extent, the total loss aggregating from \$75,000 to \$125,000. The report states that no storm of equal severity has ever been known in Hamilton county. The hailstones were small on the outer edge of the storm, but near the centre they were half the size of hens' eggs. The storm lasted from five to ten minutes, leaving the ground covered with hailstones to a depth of from three to six inches. All windows on the north and east sides of buildings were broken.

Kansas.—Westmoreland, Pottawatomie county: from 6.30 to 7 p. m. of the 24th one of the severest hail storms prevailed that has been known in this county for many years. The hailstones were as large as hens' eggs and broke the glass in many windows. The growing crops were also badly damaged.

Maine.—Bangor: a severe hail storm passed a few miles north of this place on the 13th.

Minnesota.—Fergus Falls, Otter Tail county: a severe hail storm occurred about 3 p. m. on the 24th, which, in many places, totally destroyed the grain crop in this vicinity.

Montana.—Fort Assinaboine: on the 15th, a hail storm of unusual severity passed between Helena and Silver City. The track of the storm was about one mile wide, within which many birds and small animals were killed. The storm lasted for about twenty minutes.

Nebraska.—Omaha: a violent hailstorm occurred in Fillmore county on the 13th; the storm's path was about three miles in width and passed from west to east, the destruction being greatest near the centre of the storm; the hail stones were of a variety of sizes and shapes, and fell with such force that in some instances the roofs of buildings were reduced to splinters; many small animals were killed.

Fremont, Dodge county: violent hail-storms occurred in Merrick and York counties on the afternoon of the 20th. In the vicinity of Bradshaw, York county, over a strip of country five miles wide and about thirteen miles in length, the crops were entirely ruined, the hailstones being as large as hens' eggs. All but eight sections of the township of Brad-

shaw was visited by the storm and the losses sustained will aggregate about \$100,000.

Tecumseh, Johnson county: severe hail storms passed to the northeast and southwest of this place on the 30th; that passing to the eastward was about one half mile wide and six miles in length, and was very destructive to the growing crops. The path of the storm which passed to the southward was very narrow and about six miles in length; it was also destructive to crops.

New Hampshire.—Claremont, Sullivan county: one of the severest hail storms ever known in this region passed over Cornish on the afternoon of the 19th; it started on the east side of the Connecticut river near Windsor, Vermont, and extended northward to Plainfield, its path being from one-half mile to one mile in width. The hail-stones were as large as hens' eggs, and in some places accumulated to a depth of two feet. The damage is estimated at from \$4,000 to \$5,000.

New York.—Newburg, Orange county: a severe wind and hail storm occurred in this city on the afternoon of the 11th; the hail stones were of considerable size and caused serious injury to fruit.

Rochester: during a thunder-storm on the afternoon of the 12th a heavy fall of hail occurred in the western part of the city, the width of the hail-belt being about one fourth of a mile. All kinds of vegetation was seriously injured, and much window-glass was destroyed; the hail stones were as large as walnuts.

Kingston, Ulster county: a severe hail storm occurred on the afternoon of the 19th; the ground was covered with hail stones, some of them measuring two inches in circumference. The damage to grape vines and fruit and to green-houses was very great.

Ohio.—Toledo: the steamer "Evening Star," from Erie to Toledo, when near the latter port, between 7 and 8 p. m. of the 30th, was caught in a severe hail squall.

Pennsylvania.—Erie: A hail storm occurred on the 12th at a point six miles east of Erie; the hail-stones were unusually large, and damaged the crops to a great extent.

Vermont.—Brattleborough, Windham county: a destructive hail storm occurred during the night of the 19-20th, which caused great damage to crops in various portions of this county.

Wisconsin.—Eau Claire, Eau Claire county: on the afternoon of the 25th a violent hail storm passed over the towns of Pleasant Valley, Clear Creek, and Otter Creek. Hogs, sheep, and cattle were killed by the hail stones, some of which weighed several ounces. The damage to crops is estimated at \$20,000.

Hail storms of less severity than those reported above, occurred in the various states and territories as follows:

Arizona.—Wickenburg, 15th.

Arkansas.—Mount Ida and Fort Smith, 27th.

California.—Blue Lake, 12th.

Colorado.—Denver, 21st; Pike's Peak, 12th, 15th, 21st, 29th.

Connecticut.—Bethel, 12th, 19th; Voluntown, 13th.

Dakota.—Deadwood, 18th, 25th; Fort Bennett, 1st, 25th; Fort Lincoln, 2d; Fort Sisseton, 25th; Fort Totten, 23d; Fort Yates, 1st, 2d, 28th; Huron, 21st, 23d, 25th.

Delaware.—Delaware Breakwater, 13th.

District of Columbia.—West Washington, 11th.

Georgia.—Augusta, 11th.

Illinois.—Edgington, 4th; Sycamore, 24th, 25th.

Indiana.—Wabash, 24th.

Indian Territory.—Cantonment, 29th.

Iowa.—Guttenberg, 23d; Independence, 29th; Manchester, 3d, 11th; Ottumwa, 21st.

Kansas.—Allison, 26th; Fort Scott, 4th, 27th; Salina, 1st; Sherlock, 26th; Topeka, 30th; Wellington, 15th.

Maryland.—Baltimore and Fort McHenry, 11th.

Massachusetts.—Fall River, 13th; Heath, 9th.

Michigan.—Escanaba, 11th.

Minnesota.—Duluth, 10th; Moorhead, 3d, 28th, 31st; Saint Vincent, 20th.

Mississippi.—Vicksburg, 31st.

Table of smallest monthly precipitation—July, 1884.

Station.	Amt.	Station.	Amt.
<i>Alabama.</i>		<i>California,—Continued.</i>	
Fort Deposit	0.41?	Petaluma	0.00
<i>Arizona.</i>		Bishop Creek	0.00
Casa Grande	0.00	Keeler	0.00
Yuma	0.00	Princeton	0.00
Phoenix	0.07	San Diego	0.00
Fort McDowell	0.08	San Francisco	Trace
Fort Apache	0.14	Los Angeles	0.02
Fort Verde	0.19	Hydesville	0.05
Wickenburg	0.28	Blue Lake	0.24
Fort Thomas	0.26	Cape Mendocino	0.45
San Carlos	0.37	<i>Colorado.</i>	
Pantano	0.40	Pike's Peak	0.41
Maricopa	0.53	Denver	0.65
Tucson	0.65	Pueblo	0.72
Fort Bowie	0.65	<i>Idaho.</i>	
Fort Grant	0.67	Boise City	0.60
Benson	0.70	<i>Indian Territory.</i>	
<i>Arkansas.</i>		Fort Sill	0.23
Prescott	0.72	<i>Louisiana.</i>	
Texarkana	0.98	Natchitoches	0.00
<i>California.</i>		Shreveport	0.06
Oakland	0.00	<i>Mississippi.</i>	
Niles	0.00	Meridian	0.03
Pleasanton	0.00	Hazlehurst	0.14
Livermore	0.00	Jackson	0.20
Tracy	0.00	Brookhaven	0.48
Lathrop	0.00	Natchez	0.62
Stockton	0.66	Okolona	0.69
Galt	0.00	<i>Montana.</i>	
Brighton	0.00	Fort Maginnis	0.64
Sacramento	0.00	Fort Custer	0.80
Rocklin	0.00	<i>Nevada.</i>	
Auburn	0.00	Reno	0.00
Colfax	0.00	Humboldt	0.00
Alta	0.00	Golconda	0.00
Emigrant Gap	0.00	Battle Mountain	0.00
Cisco	0.00	Browns	0.00
Summit	0.00	Elko	0.00
Truckee	0.00	Wells	0.00
Boca	0.00	Toano	0.00
Marysville	0.00	Hawthorne	0.00
Chico	0.00	Carson City	0.00
Tehama	0.00	Hallock	0.03
Red Bluff	0.00	Otego	0.04
Redding	0.00	Hot Springs	0.04
Modesto	0.00	Palisade	0.05
Turlock	0.00	Carlin	0.07
Merced	0.00	Tecoma	0.10
Borden	0.00	Brown's	0.15
Fresno	0.00	<i>New Mexico.</i>	
Kingburg	0.00	Fort Craig	0.42
Martinez	0.00	Deming	0.53
Dunnigan	0.00	Fort Union	0.70
Williams	0.00	<i>Oregon.</i>	
Willows	0.00	Roseburg	0.05
Orland	0.00	Klamath Agency	0.24
Antioch	0.00	Umatilla	0.32
Brentwood	0.00	Lakeview	0.50
Byron	0.00	<i>Texas.</i>	
South Vallejo	0.00	Dallas	0.00
Suisun	0.00	Cuero	0.00
Davis	0.00	Hearne	0.00
Napa	0.00	Huntsville	0.00
Calistoga	0.00	San Antonio	0.00
Woodland	0.00	Tyler	0.00
Knight's Landing	0.00	Rio Grande City	0.00
San Mateo	0.00	New Uln	0.00
Menlo Park	0.00	El Paso	0.00
San José	0.00	Hempstead	0.01
Tennant	0.00	Longview	0.03
Gilroy	0.00	Palestine	0.06
Hollister	0.00	Waco	0.06
Pajaro	0.00	Fort Brown	0.08
Salinas City	0.00	Clarksville	0.12
Chualar	0.00	Brownsville	0.23
Soledad	0.00	Columbia	0.30
Monterey	0.00	Cleburne	0.32
Santa Cruz	0.00	Indianola	0.33
Aptos	0.00	Fort Davis	0.35
College City	0.00	Belton	0.42
Sequel	0.00	Paris	0.48
Goshute	0.00	Fort Stockton	0.52
Tulare	0.00	Sour Lake	0.94
Delano	0.00	<i>Utah.</i>	
Sumner	0.00	Ogden	0.00
Caliente	0.00	Promontory	0.00
Keene	0.00	Blue Creek	0.00
Tehachapi	0.00	Terrace	0.03
Mojave	0.00	Kelton	0.15
Ravenna	0.00	Fort Thornburg	0.16
Newhall	0.00	Corinne	0.20
San Fernando	0.00	Nephi	0.25
Spadra	0.00	Salt Lake City	0.27
Colton	0.00	<i>Washington Territory.</i>	
White Water	0.00	Bainbridge Island	0.10
Indio	0.00	Ainsworth	0.23
Mammoth Tank	0.00	Dayton	0.32
Daggett	0.00	Olympia	0.60
Fenner	0.00	Fort Spokane	0.82
Needles	0.00	<i>Wyoming.</i>	
Ione	0.00	Fort Fred Steele	0.14
Farmington	0.00	Fort Bridger	0.21
Lemoore	0.00	Cheyenne	0.60
Anaheim	0.00		

Montana.—Fort Assinaboine, 7th, 11th; Fort Custer, 22d.

Nebraska.—De Soto, 23d; Fremont, 18th; Marquette, 21st, 24th, 27th, 29th; North Platte, 10th, 18th; Stockham, 27th.
New Hampshire.—Mount Washington, 13th.
New Jersey.—Readington, 12th; South Orange, 19th.
New York.—Albany and Humphrey, 12th; Ithaca and Mountville, 13th.
Ohio.—Jacksonborough, 24th.
Pennsylvania.—Catawissa, 31st; Drifton, 11th; Fallsington, 5th; Philadelphia, 5th.
Tennessee.—Ashwood, 9th; Milan, 30th.
Texas.—Fort Stockton, 24th.
Utah.—Salt Lake City, 12th.
Vermont.—Strafford and Woodstock, 19th.
Virginia.—Chincoteague, 24th; Fort Myer, 11th.
Wisconsin.—Embarras, Neillsville and Wausau, 22d; La Crosse, 25th; Sussex, 23d.

SNOW.

The observer on the summit of Mount Washington, New Hampshire, reports that a light flurry of snow occurred at that station during the early morning of the 21st.

On the summit of Pike's Peak, Colorado, snow is reported to have fallen on the following dates: 11th, 23d, 24th, 28th and 29th.

Table of rainy and cloudy days, relative humidity, and dew-point for July, 1884.

Districts.	Rainy days.	Cloudy days.	Rel. humidity, °	Dew-point.
			Percentages.	
New England.....	From 12 to 18	From 5 to 11	From 71.9 to 84.6	From 53.1 to 61.0
Middle Atlantic states.....	" 10 " 17	" 4 " 10	" 64.4 " 83.7	" 57.4 " 68.2
South Atlantic states.....	" 9 " 18	" 3 " 14	" 71.2 " 83.8	" 65.6 " 74.0
Florida peninsula.....	" 7 " 16	" 2 " 7	" 71.2 " 75.9	" 73.6 " 74.4
Eastern Gulf states.....	" 8 " 19	" 1 " 4	" 69.7 " 81.0	" 71.8 " 73.8
Western Gulf states.....	" 2 " 9	" 0 " 3	" 67.1 " 80.8	" 71.4 " 76.6
Rio Grande valley.....	" 0 " 3	" 0 " 0	" 96.9 " 78.0	" 68.0 " 74.4
Ohio valley.....	" 8 " 15	" 5 " 9	" 60.0 " 73.2	" 57.5 " 66.5
Tennessee.....	" 12 " 15	" 0 " 7	" 74.3 " 78.0	" 66.1 " 68.7
Lower lake region.....	" 10 " 15	" 3 " 11	" 64.7 " 75.4	" 54.9 " 58.8
Upper lake region.....	" 10 " 20	" 1 " 9	" 69.7 " 75.0	" 49.5 " 58.4
Extreme northwest.....	" 12 " 17	" 4 " 15	" 67.7 " 82.0	" 53.2 " 55.9
Upper Mississippi valley.....	" 9 " 16	" 3 " 6	" 67.7 " 75.2	" 57.9 " 71.2
Missouri valley.....	" 13 " 17	" 2 " 6	" 69.2 " 77.0	" 57.3 " 66.0
Northern slope.....	" 4 " 15	" 0 " 7	" 43.0 " 74.2	" 35.8 " 62.2
Middle slope.....	" 0 " 12	" 0 " 5	" 43.4 " 68.0	" 47.0 " 64.2
Southern slope.....	" 3 " 7	" 0 " 3	" 50.4 " 58.6	" 54.4 " 67.7
Southern plateau.....	" 2 " 15	" 0 " 4	" 31.6 " 53.7	" 45.9 " 52.3
Northern plateau.....	" 2 " 11	" 1 " 10	" 54.8 " 59.3	" 46.4 " 53.5
North Pacific coast region.....	" 2 " 14	" 7 " 14	" 53.0 " 59.3	" 49.5 " 53.4
Middle Pacific coast region.....	" 0 " 10	" 0 " 5	" 36.8 " 87.1	" 48.0 " 55.5
South Pacific coast region.....	" 0 " 2	" 0 " 0	" 43.2 " 78.2	" 59.5 " 61.7
Mr. Washington, N. H.....	Twenty-two	Seven	94.3	42.9
Pike's Peak, Colo.....	Eight	One	94.3	28.2
Salt Lake City, Utah.....	Two	None	94.7	37.4

* Relative humidity corrected for altitude

COTTON REGION REPORTS.

In the table below are shown the average precipitation and the means of the maximum and minimum temperatures for July 1884, with the July averages for the two preceding years, in the cotton districts. A comparison of these averages shows an excessive precipitation in all of the districts except for New Orleans and Vicksburg, and Galveston, where there were marked deficiencies. No decided changes are shown in the temperature, which was generally above the average.

Temperature and rainfall data for the cotton districts, July.

Districts.	Rainfall.			Temperature.						Extremes for July, 1884.	
	Average for July of two preceding years.	Averages for July, 1884.	Departures.	Maximum.			Minimum.				
				Mean for July of two preceding years.	Mean for July, 1884.	Departures.	Mean for July of two preceding years.	Mean for July, 1884.	Departures.		
New Orleans...	5.80	1.62	+ 4.18	91.8	95.3	+ 3.5	72.9	74.9	+ 2.0	106	62
Savannah.....	4.81	5.39	+ 0.57	93.3	91.9	- 1.4	71.5	72.2	+ 0.7	103	60
Charleston.....	5.84	7.16	+ 1.32	92.8	91.7	- 1.1	70.0	72.2	+ 2.2	98	40
Atlanta.....	3.34	4.39	+ 1.04	90.6	90.1	- 0.5	68.5	69.1	+ 0.6	104	67
Wilmington.....	4.03	6.01	+ 1.98	91.7	89.9	- 1.8	69.0	68.8	- 0.2	101	59
Memphis.....	4.72	4.86	+ 0.14	89.7	90.4	+ 0.7	67.7	69.1	+ 1.4	102	56
Galveston.....	2.94	0.23	- 2.71	94.0	97.6	+ 3.6	72.5	73.8	+ 1.3	107	63
Vicksburg.....	6.89	3.80	- 3.03	90.8	94.0	+ 3.2	70.6	72.9	+ 2.3	102	03
Montgomery.....	3.41	5.52	+ 2.11	92.0	91.9	- 0.1	68.4	69.4	+ 1.0	101	54
Augusta.....	3.43	3.66	+ 0.23	92.2	92.6	+ 0.4	71.0	69.7	- 1.3	106	52
Little Rock.....	2.73	2.80	+ 0.07	91.7	94.7	+ 3.0	65.4	70.6	+ 5.2	104	61
Mobile.....	2.71	5.14	+ 2.43	94.0	93.7	- 0.3	69.9	72.3	+ 2.5	104	60

WINDS.

The most frequent directions of the winds during the month of July, 1884, are shown on chart ii. by arrows flying with the wind. In the Gulf states, Ohio valley, lower lake region, and in the Atlantic coast districts the most frequent directions were from south to west; in the extreme northwest and upper Mississippi valley they were northerly; in the Missouri valley, middle, and southern slopes they were from southeast and south; in the northern slope, western plateau districts, and on the Pacific coast they were variable.

TOTAL MOVEMENTS OF THE AIR.

[In miles.]

In the following table are given the stations reporting the largest and smallest total movements of the air in each of the various districts:

Districts.	Stations reporting largest.	Miles.	Stations reporting smallest.	Miles.
New England.....	Block Island, R. I.....	9,424	Eastport, Maine.....	4,191
Middle Atlantic states.....	Del. Breakwater, Del.....	10,542	Lynchburg, Va.....	2,174
South Atlantic states.....	Kitty Hawk, N. C.....	10,004	Augusta, Ga.....	2,493
Florida peninsula.....	Cedar Keys.....	6,311	Key West.....	5,491
Eastern Gulf states.....	Pensacola, Fla.....	5,218	Montgomery, Ala.....	3,372
Western Gulf states.....	Indianola, Tex.....	8,798	Fort Smith, Ark.....	2,650
Rio Grande valley.....	Rio Grande City, Tex.....	7,750	Brownsville, Tex.....	7,307
Tennessee.....	Knoxville.....	3,520	Nashville.....	3,294
Ohio valley.....	Columbus, Ohio.....	4,358	Indianapolis, Ind.....	3,390
Lower lake region.....	Sandusky, Ohio.....	7,848	Toledo, Ohio.....	3,729
Upper lake region.....	Duluth, Minn.....	6,446	Chicago, Ill.....	4,293
Extreme northwest.....	Fort Totten, Dak.....	7,974	Moorhead, Minn.....	4,723
Upper Mississippi valley.....	Saint Louis, Mo.....	7,151	Dubuque, Iowa.....	3,093
Missouri valley.....	Fort Bennett, Dak.....	5,752	Leavenworth, Kans.....	3,323
Northern slope.....	Cheyenne, Wyo.....	8,138	Deadwood, Dak.....	3,642
Middle slope.....	Dodge City, Kan.....	9,795	Denver, Colo.....	5,073
Southern slope.....	Fort Stockton, Tex.....	7,699	Fort Davis, Tex.....	4,211
Southern plateau.....	Fort Apache, Ariz.....	4,719	El Paso, Tex.....	2,281
Middle plateau.....	Salt Lake City, Utah.....	4,023		
Northern plateau.....	Dayton, Wash. T.....	4,334	Lewiston, Idaho.....	1,268
North Pacific coast region.....	Fort Canby, Wash. T.....	4,239	Olympia, Wash. T.....	1,898
Middle Pacific coast region.....	Cape Mendocino, Cal.....	16,385	Red Bluff, Cal.....	4,134
South Pacific coast region.....	Yuma, Ariz.....	4,329	Los Angeles, Cal.....	3,164

On the summits of Mount Washington, New Hampshire, and Pike's Peak, Colorado, the total movements of the air were 25,815 and 12,834 miles, respectively.

HIGH WINDS.

On the summit of Mount Washington, New Hampshire, maximum velocities of fifty miles or more per hour occurred as follows: 56, se., 4th; 60, se., 5th; 70, sw., 6th; 64, sw., 7th; 64, nw., 9th; 84, nw., 10th; 60, w., 12th; 59, w., 13th; 87, nw., 14th; 84, nw., 15th; 70, nw., 16th; 70, nw., 17th; 52, nw., 19th; 56, w., 20th; 85, nw., 21st; 84, nw., 22d; 81, w., 23d; 96, nw., 24th, (maximum); 59, nw., 25th; 71, sw., 31st.

The following high velocities were reported from Pike's Peak, Colorado: 50, w., 4th; 56, w., 6th; 50, sw., 7th; 58, sw., 8th; 64, w., 14th, (maximum); 50, w., 16th; 58, w., 22d; 52, w., 29th.

Other stations reporting velocities of fifty miles or more per hour are as follows:

Fort Maginnis, Montana, 52, nw., 31st.
 Fort Assinaboine, Montana, 53, e., 19th.
 Fort Benton, Montana, 50, sw., 3d.
 Cairo, Illinois, 50, ne., 25th.
 Dodge City, Kansas, 56, ne., 9th; 50, ne., 26th.
 La Crosse, Wisconsin, 63, n., 25th.

LOCAL STORMS.

Arkansas.—Fort Smith: between 8 and 9 p. m. of the 27th a tornado passed in a southeasterly direction over portions of the Cherokee and Choctaw reservations, in the Indian Territory, crossing the Arkansas line about fifteen miles south of Fort Smith. The corn and cotton crops in the southern part of this (Sebastian) county were badly damaged by the hail, which was of unusual size, and covered the ground in some places to a depth of ten inches. The noise from the tornado cloud was distinctly heard during its passage. Only a light shower of rain and hail fell at Fort Smith.

Colorado.—Pike's Peak: a severe storm occurred at Colorado Springs on the 9th. Several houses at that place and in Manitou were flooded by the heavy rainfall.

Cañon City, Fremont county: during the night of June 30—

July 1st a "cloud-burst" occurred in this vicinity. Large quantities of rock and earth were washed out, and in numerous places the track of the Denver & Rio Grande railroad was covered with several feet of earth, a number of flat cars being almost entirely covered. The Arkansas river rose two feet. The town water-works were slightly damaged, necessitating temporary cutting off of the water supply.

Connecticut.—New Haven: a severe thunders-torm, accompanied by hail, occurred between 5 and 7 p. m. of the 19th. Hail fell for twenty minutes, the hail stones being as large as walnuts. More than two inches of rain fell during the storm which caused considerable damage by flooding cellars and basements. A high wind prevailed at this place from 5 to 8 p. m. on the 23d; the yacht "Magnet" was driven on a reef of the old light-house and sustained slight damage.

Reports from New Hartford, Litchfield county, state that a violent storm occurred at that place during the night of the 23-24th. The Greenwood Manufacturing Company's building was unroofed, and the crops sustained serious injury.

Dakota.—Huron: a severe storm prevailed between 5.15 and 6 p. m. on the 1st. A number of small buildings were blown down; the wind for five minutes blew at the rate of 55 miles per hour.

Fort Meade, Lawrence county: a tornado passed over the Red Water, Whitewood, and Spring valleys on the 1st, which destroyed barns, fencing, etc. The track of the storm was about 1,000 feet wide, and crossed the Belle Fourche river about twenty-four miles from Fort Meade. Hail fell in large quantities for about eight minutes.

Wahpeton, Richland county: reports from Fairmont, twelve miles south of this place state that a tornado occurred there on the 1st. Three freight cars were blown from the track of the Fargo Southern railroad, and a school house in the "Williams" district was entirely demolished, all of the pupils, fifteen in number, receiving more or less serious injuries.

Yankton: a severe storm prevailed at this place on the 3d and 4th; on the last-mentioned date between 5 and 7 p. m. a storm cloud was observed approaching from the northwest, but before reaching the city it divided and passed around the city. The most violent part of the storm lasted only a few minutes, prostrating many trees and causing damage to several buildings. Reports from Vermilion, Clay county, state that the storm was very severe at that place.

Sioux Falls, Minnehaha county: a very destructive storm visited this county on the 21st. Reports from Dell Rapids state that the damage caused in that vicinity is estimated at \$100,000, and at Valley Springs, at \$50,000. Seven persons were killed by lightning in this county during the storm.

Georgia.—Crawford, Oglethorpe county: an unusually heavy rainfall occurred on the afternoon of the 3d. Reports from various points in this, and the neighboring counties, state that crops were considerably injured.

Augusta: a thunder storm of considerable violence occurred between 5 and 6 p. m. of the 11th; several buildings in this city and vicinity were partly unroofed.

Illinois.—Saint Louis, Missouri, 6th: reports from Christian, Macon, Sangamon and Shelby counties, and from other localities in central Illinois, state that a very severe and destructive wind storm occurred during the night of the 4-5th. In the vicinity of Illiopolis, Sangamon county, several farm houses were badly damaged, and also wheat shocks and growing corn, the latter being beaten to the ground. The losses sustained in Sangamon county are estimated at more than \$100,000. Numerous dwellings in Macon county were wrecked, the damage in that county being estimated at \$200,000.

Hillsborough, Montgomery county: a severe storm passed over the northern and eastern portions of this county on the 23d. The wheat and hay shocks were scattered, and trees and fences prostrated. In some localities serious damage was done to the corn crop, whole fields having been beaten down by the wind and rain.

Tuscola, Douglass county: the most severe wind and rain-

storm of this season occurred during the night of the 24-25th; the growing crops in this vicinity were damaged to the extent of many thousand dollars.

Cairo: a severe storm prevailed between 6.45 and 7.55 p. m. of the 26th, the wind attaining a velocity of fifty miles from the northeast; the course of the storm was southwesterly.

Indiana.—Indianapolis: on the afternoon of the 24th, a thunder storm of considerable severity occurred at points north of this city, blowing down many trees.

Iowa.—Sioux City, Woodbury county: a tornado passed through the southeastern part of this town at 6 p. m. on the 4th. It came from the west-northwest and passed eastward. The tornado cloud is reported to have been of the usual funnel-shape, and moved with great rapidity. A church tower was blown down and the walls of the building badly damaged; a school-house and plow factory, with other small buildings were demolished. The plate glass fronts of several stores were also destroyed and a large number of trees blown down. At the oil works a large oil tank was blown down, while a pile of empty barrels directly in front of it remained undisturbed.

Wapello, Louisa county: a very severe storm occurred in this vicinity on the afternoon of the 4th; it began at 7.40 p. m., and continued for forty minutes, being accompanied by torrents of rain and a small quantity of hail of sufficient size to break windows. Shade and fruit trees were prostrated and buildings and fences demolished. The greatest damage was caused over an area about one mile wide, Wapello being in about the centre of the storm.

Dubuque: during the morning of the 23d a thunder-storm, accompanied by heavy rainfall, passed over this locality. Considerable damage was done in Dubuque by the flooding of cellars.

Knoxville, Marion county: this section was visited by a destructive wind and rain storm between 10 and 11 p. m. of the 23d. Barns and other out-buildings, trees, and fences were blown down.

Osceola, Clark county: a severe storm occurred between 9 and 10 p. m. of the 23d, which caused great damage to ornamental and fruit trees. The unharvested grain was almost ruined, and that shocked in the fields was badly scattered.

Kansas.—Iola, Allen county: during a severe storm on the afternoon of the 24th a new barn, three miles distant, was blown down.

Dodge City: a severe storm passed over this place on the evening of the 26th, reaching its greatest violence at 9.20 p. m.; the maximum wind velocity for five minutes was 84 miles per hour. The storm caused great damage in the surrounding country.

Sherlock, Finney county: at about 8 p. m. of the 26th a strong wind began, which suddenly increased in force until it reached an estimated velocity of 80 miles per hour. The most violent part of the storm lasted about five minutes. Outbuildings were demolished and the grain stacks in this vicinity were scattered. It is reported that hail stones, three inches in diameter, fell at a point twelve miles north of this place.

Kentucky.—Richmond, Madison county: during a storm which occurred at about noon of the 2d, several trees at the University grounds were blown down. The most violent part of the storm was confined to a narrow path about one hundred yards in width.

Maryland.—Westminster, Carroll county: unusually severe storms occurred in portions of this county during the nights of the 4th and 5th, which blew down trees and scattered the grain shocks.

Annapolis: a violent wind and rain storm prevailed over Chesapeake bay on the afternoon of the 24th. The steamer "Georgiana" had the windows of her upper saloon blown out when off Sandy Point.

Baltimore: an unusually severe storm occurred on the afternoon of the 12th; from 3.07 to 4.50 p. m., 3.75 inches of rain fell, and nearly all of that amount fell in one hour. A large amount of damage was caused by the flooding of cellars and basements. The storm was accompanied by a slight fall of

hail of small size, the hailstones measuring about one-fourth inch in diameter. The lightning struck numerous buildings, some of which were damaged to a considerable extent. Another severe storm occurred at Baltimore on the afternoon of the 31st. From 5.40 to 6.00 p. m., rain fell in torrents accompanied by high wind, which caused much damage. The maximum velocity of the wind was thirty-two miles per hour.

Michigan.—Detroit: a storm of unusual severity is reported to have occurred at Holland, Ottawa county, on the morning of the 23d.

Grand Haven: brisk to high variable winds prevailed during the early morning of the 23d; several shade trees were blown down, and considerable damage was done by lightning; maximum wind velocity, 38 miles, from the northeast.

Minnesota.—Saint Vincent: a violent storm swept over the valley, eight miles north of this place, on the 13th; several dwellings were wrecked, fences prostrated, stock killed, and the grain fields badly damaged.

Fergus Falls, Otter Tail county: the damage caused in this vicinity by the storm on the 23d is estimated at \$75,000.

Moorhead: a destructive storm occurred in this county at 5.30 p. m. of the 31st. The storm first struck the town of Grandin, Dakota, thirty miles north of Moorhead, and pursued a southeasterly course through Clay county, Minnesota. Hail is reported to have fallen for twenty-five minutes, covering the ground to a depth of four inches. The damage to crops is estimated at \$100,000.

Missouri.—Kansas City: reports from Rich Hill, Bates county, state that a destructive wind storm occurred at that place on the morning of the 4th. A church was entirely destroyed and numerous other buildings were injured. The damage done in Rich Hill and vicinity is estimated at \$20,000. Considerable damage was also done at Walnut, in the same county.

Nebraska.—Omaha: a violent storm occurred at 1 p. m. of the 3d, the wind reaching a velocity of forty-two miles per hour, and blowing down trees and fencing. Another severe storm occurred here about 6 p. m. on the 18th, accompanied by very heavy rain which caused damage to streets and sewers.

Lincoln, Lancaster county: at about 10.30 p. m. of the 20th, a violent storm, accompanied by very heavy rain, occurred. The residents of lower portions of Lincoln were compelled to move out of their dwellings, which were flooded.

New Jersey.—Wyckoff, Bergen county: on the afternoon of the 6th a peculiar storm occurred in the northern part of this county. A sudden gust of wind uprooted an entire orchard, and a house near by was badly strained, while at a few hundred yards distance, there was scarcely a breeze felt.

New York.—Buffalo: a severe gale occurred on the 23d, beginning at 10 a. m. and ending at 2 p. m.; at 1 p. m. a maximum wind velocity of forty miles per hour, from the west, was recorded. A large number of vessels were detained in harbor during the storm.

Poughkeepsie: a severe storm of wind and rain prevailed along the Hudson river on the afternoon of the 23d. The storm began at about 6 p. m. and lasted about twenty minutes. Many trees were uprooted and telegraph lines were prostrated. The sloop "Willis" was blown ashore at Cornwall.

Oswego: during a severe squall on the morning of the 23d, the schooner "Senator Blood" was dismasted off Kingston.

North Carolina.—Edenton, Chowan county: a violent storm occurred at this place at 5 p. m. of the 26th, which caused serious injury to a number of buildings.

Ohio.—Millersburg, Holmes county: the severe storm of the 24th caused much damage to out-buildings, orchards, etc., in this county.

Batavia, Clermont county: a severe storm of wind and rain occurred during the night of the 24-25th, which caused serious injury to the corn crop; a large barn in this vicinity was destroyed.

Pennsylvania.—Easton, Northampton county: on the evening of the 4th a tornado occurred about one-half mile north of

Jacksonville, Lehigh county. At 7 p. m. a heavy, black cloud, at a low altitude, was observed approaching with great rapidity from the southwest, and, at the same time, two others were observed, one coming from the northeast and the other from the southeast. The three clouds met at a height just above the trees at the foot of the Blue mountains, causing a noise like distant thunder, and in appearance resembling a huge balloon. Water fell in torrents from the centre of the black mass of clouds, which was about twenty feet in diameter. After the meeting of the clouds they pursued a northeasterly course, traveling at an estimated velocity of fifty miles per hour, and destroying the timber as the cloud struck the mountain here and there. The cloud which approached from the southwest caused considerable damage before coming in contact with the other clouds.

Reading: a storm accompanied by high wind and heavy rainfall, prevailed on the 6th in Berks, Lebanon, and Montgomery counties. The country roads were submerged and bridges washed away; barns and other buildings were unroofed.

Pittsburg: on the 25th the steamer "J. M. Bowell," when near Coal Centre, on the Monongahela river, was struck by a squall and capsized.

South Carolina.—Columbia: at 4.30 p. m. of the 31st, a storm passed over this city, prostrating trees and fencing. The approach of the storm cloud, which was of an unusually threatening appearance, caused considerable alarm.

Tennessee.—Clarksville, Montgomery county: at about 6 p. m. on the 2d a severe wind and rain storm lasting about three-fourths of an hour, passed over this section. At Clarksville, no damage was done other than the blowing down of a few trees, but in the surrounding country the growing crops were badly injured. At Trenton, Todd county, Kentucky, the storm was more severe than at any other point in this section; at that place numerous buildings were destroyed. A few miles from Trenton a house, in which were four men, was blown down, killing all of the men. It is reported that not less than forty barns were destroyed in the vicinity of Trenton.

Nashville: a violent thunder-storm began at 5.38 p. m. of the 5th, which resulted in considerable damage in this vicinity and in the surrounding counties. In Nashville several buildings were unroofed and many shade trees were blown down.

Knoxville: a violent storm began at 9.30 p. m. on the 5th, the wind reaching a velocity of 44 miles per hour. In this city a few trees and some fencing were blown down, and a church building was damaged. The crops in this part of the state were badly damaged.

Loudon, Loudon county: a violent storm visited this section during the night of the 5-6th. A large brick building on the Tennessee river was completely destroyed, together with a number of out-buildings in this vicinity.

Nashville: reports from Dark's Mill, Maury county, state that a very destructive storm occurred at that place on the morning of the 30th. The path of the storm was about one-half mile wide, within which nearly all property was destroyed.

Chattanooga: on the 31st a severe thunder storm from the southwest began at 10.50 a. m. and ended at 1.35 p. m.; a violent gust of wind prostrated small trees and insecure fencing. Numerous buildings in the city were damaged, the losses being generally slight. Reports from several of the neighboring counties, both in Tennessee and in the northern portions of Georgia and Alabama, state that the growing crops were damaged to a considerable extent. A dwelling on Look-out mountain, near Sulphur Springs, Alabama, was destroyed and one of the inmates killed.

Virginia.—Norfolk: on the afternoon of the 28th a violent storm occurred in the vicinity of Hickory Grove, Norfolk county. The largest trees were twisted off and buildings were destroyed. The path of the storm was about two hundred yards in width.

Wisconsin.—Milwaukee: a severe storm of hail and wind occurred in various portions of this state during the night of the 22-23d. It was most severe in Fond du Lac, Jefferson, Sheboygan, Walworth, Washington, and Waukesha counties.

Jefferson, Jefferson county: a violent storm from the west passed over this place at 2.45 a. m., on the 23d. Residences, barns, and other out-buildings throughout the storm's path were more or less damaged. The damage to property at Jefferson is estimated at \$50,000.

Sussex, Waukesha county: a severe thunder storm, accompanied by hail, passed north of this station at 1.30 a. m. of the 23d. Great damage was done to the grain crops.

La Crosse: a storm of unusual violence prevailed at this place on the afternoon of the 25th. It began at 3.55 p. m., a wind velocity of sixty-three miles per hour being recorded; a greater velocity was attained later, but as the anemometer became unserviceable, the exact velocity is not known. The observer estimates the maximum wind velocity at seventy-five miles per hour. The high wind caused considerable damage in this city and vicinity; in some localities the crops were seriously injured. At a point one mile north of La Crosse, hail fell in large quantities. The storm approached La Crosse from the northwest and passed off to the southeast, its track being narrow.

NAVIGATION.

STAGE OF WATER IN RIVERS.

In the following table are shown the danger points at the various river stations, the highest and lowest stages of July, 1884, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark, July, 1884.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.	
		Date.	Height.	Date.	Height.		
<i>Red River:</i>							
Shreveport, Louisiana.....	29 9	1	18 2	31	7 0	11	2
<i>Arkansas:</i>							
Little Rock, Arkansas.....	33 0	4	10 6	26	6 3	4	3
Fort Smith, Arkansas.....		1	2 8	19, 23	1 4	4	6
<i>Missouri:</i>							
Yankton, Dakota.....	20 0	4, 5	19 11	26	16 10	3	1
Omaha, Nebraska.....	16 0	4	13 3	26	9 0	4	3
Leavenworth, Kansas.....	21 0	5, 6	17 3	28	13 5	3	10
<i>Mississippi:</i>							
Saint Paul, Minnesota.....	14 6	1	4 2	23	2 4	1	10
La Crosse, Wisconsin.....	18 0	1	4 5	23	1 9	2	8
Dubuque, Iowa.....	21 10	1	7 8	22	4 3	3	5
Davenport, Iowa.....	15 0	1	5 10	23	2 10	0	0
Keokuk, Iowa.....	14 6	1	6 4	25	3 4	0	0
Saint Louis, Missouri.....	30 0	17	20 10	26	14 11	11	11
Cairo, Illinois.....	40 0	10	23 2	28	15 6	8	8
Memphis, Tennessee.....	34 0	1	17 9	30	10 10	6	11
Vicksburg, Mississippi.....	41 0	1	29 7	31	19 4	10	3
New Orleans, Louisiana.....	—2 6	1	—4 6	31	—8 4	3	10
<i>Ohio:</i>							
Pittsburg, Pennsylvania.....	20 0	30	8 4	25	0 4	8	0
Cincinnati, Ohio.....	50 0	1	15 5	26, 27	4 10	10	7
Louisville, Kentucky.....	24 0	2, 3	7 0	26, 27, 28	3 2	3	10
<i>Cumberland:</i>							
Nashville, Tennessee.....	42 0	1	8 2	27, 28	1 10	6	4
<i>Tennessee:</i>							
Chattanooga, Tennessee.....	33 0	1	8 4	25	2 7	5	9
<i>Monongahela:</i>							
Pittsburg, Pennsylvania.....	29 0	30	8 4	26	0 4	8	0
<i>Savannah:</i>							
Augusta, Georgia.....		6	16 1	27	6 0	10	1
<i>Willamette:</i>							
Portland, Oregon.....		1	17 7	31	7 8	9	11
<i>Sacramento:</i>							
Red Bluff, California.....		1	2 5	29, 30, 31	1 2	1	3
Sacramento, California.....		1	19 4	31	11 6	7	10
<i>Mobile:</i>							
Mobile, Alabama.....		23, 27	16 11	4, 5, 17	15 0	1	11
<i>Colorado:</i>							
Yuma, Arizona.....		13, 14	27 6	30, 31	20 0	7	6

* Below bench mark.

† Below high-water mark of 1874 and 1883.

All stations on the Mississippi river, with the exception of Saint Louis, Missouri, and Cairo, Illinois, report the highest stage of water on the 1st; at Cairo and stations northward the lowest water was observed from the 22d to 25th, and south of Cairo from the 28th to 31st.

The Missouri was highest on the 4th and 5th; it was lowest at Yankton, Dakota, and Omaha, Nebraska, on the 26th, and at Leavenworth, Kansas, on the 28th. At Yankton, it was within one inch of the danger-line when at its highest stage, on the 4th and 5th.

The Ohio river remained low during the month. At Portsmouth, Ohio, navigation was suspended on the 25th, on ac-

count of low water; on the 28th there were but three feet and ten inches of water in the channel. At Pittsburg, Pennsylvania, the river reached a height of eight feet and four inches above low water, on the 30th, permitting most of the coal barges, which had been detained for the past month, to proceed down the river.

The observer at Nashville, Tennessee, reports that navigation in the Cumberland river was suspended on account of low water, on the 16th.

FLOODS.

Yuma, Arizona: portions of the Southern Pacific railroad bridge over the Colorado river were washed away on the 1st and 3d.

Fayetteville, Washington county, Arkansas: reports from Drake's creek, Madison county, state that a "cloud-burst," extending over a radius of twenty miles, occurred on the morning of the 6th. White river, and Brush, Drake's, and Richland creeks overflowed, causing much damage. Six persons were drowned by the overflow of Richland creek; several houses at Huntsville were swept away and the crops in many places were ruined.

Chesterfield, Chesterfield county, South Carolina: a very heavy fall of rain occurred during the night of the 10-11th, which caused the streams in this vicinity to overflow. Numerous mills and bridges were washed away and other damage caused. At Cheraw, the rainfall is reported to have been the heaviest known for several years, and mills and bridges in that locality were washed away. The railroad between Cheraw and Wadesborough was badly damaged, causing delay of trains.

Baltimore, Maryland, a very heavy rainfall occurred on the afternoon of the 11th, 3.75 inches water having fallen in less than two hours. A large amount of damage was caused by the flooding of the lower floors and cellars of buildings; in some portions of the western part of the city the water covered the streets to a depth of five feet.

Lexington, La Fayette county, Missouri: the heavy rains on the 24th, caused serious washouts along the line of the Missouri Pacific railroad. At Concordia, Davis creek overflowed and caused an extensive break in the road at that point.

Columbus, Lowndes county, Mississippi: more than four inches of rain fell at this place on the 28th, causing damage to the growing crops in bottom lands.

Piedmont, West Virginia: rain fell continuously from 10 a. m. of the 28th, until 5 a. m. of the 29th, causing one of the most destructive freshets that has ever occurred in this vicinity. A "cloud-burst" is reported to have occurred at the head of Castle run, near Lonaconing, Allegheny county, Maryland, partially submerging that town. George's creek, a small stream, was much swollen and horses and cattle pasturing along its banks were drowned. At Barton, Allegheny county, twenty houses were washed away and three persons were drowned. At Western Port, Allegheny county, where George's creek empties into the Potomac river, a part of the town was flooded and three houses were washed away. The Cumberland and Pennsylvania railroad was badly damaged.

HIGH TIDES.

Eastport, Maine, 21st.

Scott's Hill, North Carolina, 21st, 22d.

New River Inlet, North Carolina, 22d, 23d.

LOW TIDES.

Eastport, Maine, 9th.

Indianola, Texas, 1st, 2d, 4th, 5th, 7th to 11th, 26th to 31st.

TEMPERATURE OF WATER.

The temperature of water as observed in rivers and harbors during July, 1884, with the average depth at which the observations were made and the mean temperature of the air at the several stations, are shown in the following table. The highest observed water temperatures are: 96°.1 at Indianola, Texas; 89°.7 at Key West, Florida; 88°.7 at Galveston, Texas; 88°.5 at Cedar Keys, Florida; and 88°.2 at Augusta,

Georgia. The lowest observed water temperatures are: 46° at Marquette, Michigan; 46° at Eastport, Maine; and 50° at Duluth, Minnesota. The smallest ranges are: 2° at Baltimore, Maryland; 2° at Eastport, Maine; 2° at Jacksonville, Florida; and 2° at New London, Connecticut. The largest ranges are: 15° at Escanaba, Michigan; 16° at Duluth, Minnesota; and 17° at Marquette, Michigan.

Temperature of water for July, 1884.

Station.	Temperature at bottom.		Range.	Average depth, feet and inches.	Mean temperature of the air at station.
	Max.	Min.			
Atlantic City, New Jersey.....	73.0	68.0	5.0	2 11	70.6
Alpena, Michigan.....	69.8	64.5	7.3	12 4	61.3
Augusta, Georgia.....	86.2	75.8	12.4	8 8	80.9
Baltimore, Maryland.....	78.0	76.0	2.0	9 8	75.1
Block Island, Rhode Island.....	65.3	59.6	5.7	5 0	60.0
Boston, Massachusetts.....	65.6	57.0	8.6	21 9	60.0
Buffalo, New York.....	70.8	64.3	6.5	10 0	64.9
Canby, Fort, Washington Territory.....	65.7	61.1	4.6	15 5	58.6
Cedar Keys, Florida.....	88.5	79.9	8.6	10 9	82.6
Charleston, South Carolina.....	87.4	78.1	9.3	42 1	82.2
Chicago, Illinois.....	71.2	63.7	7.5	8 6	69.2
Chincoteague, Virginia.....	82.0	70.4	11.6	3 11	73.2
Cleveland, Ohio.....	73.4	69.1	4.3	14 0	69.0
Detroit, Michigan.....	72.2	65.9	6.3	23 6	69.8
Delaware Breakwater, Delaware.....	73.5	63.6	9.9	9 7	72.2
Duluth, Minnesota.....	66.5	50.2	16.3	9 11	62.4
Eastport, Maine.....	48.6	46.1	2.5	14 11	58.6
Escanaba, Michigan.....	67.6	52.5	15.1	18 9	62.6
Galveston, Texas.....	88.7	82.0	6.7	11 9	85.2
Grand Haven, Michigan.....	78.0	67.0	11.0	19 0	66.9
Indianola, Texas.....	91.6	84.5	7.1	8 6	83.5
Jacksonville, Florida.....	87.0	84.4	2.6	18 0	82.9
Key West, Florida.....	89.7	85.9	3.8	16 7	85.0
Mackinaw City, Michigan.....	65.3	57.7	7.6	10 0	61.3
Macon, Fort, North Carolina.....	83.2	77.5	5.7	7 7	79.1
Marquette, Michigan.....	63.0	46.0	17.0	10 0	59.9
Milwaukee, Wisconsin.....	65.2	57.1	8.1	8 0	65.8
Mobile, Alabama.....	87.4	78.1	9.3	16 1	80.1
New Haven, Connecticut.....	72.6	66.2	6.4	16 4	67.8
New London, Connecticut.....	65.0	62.2	2.8	13 1	67.5
New York City.....	72.1	67.6	4.5	10 4	70.1
Norfolk, Virginia.....	80.6	71.1	9.5	16 5	77.4
Pensacola, Florida.....	83.3	79.3	4.2	17 5	80.5
Portland, Maine.....	39.4	53.2	6.2	16 7	67.5
Portland, Oregon.....	70.1	65.4	4.7	61 5	63.5
Sandusky, Ohio.....	78.0	70.0	8.0	11 0	71.2
Sandy Hook, New Jersey.....	71.0	66.0	5.0	1 10	71.0
San Francisco, California.....	62.9	56.2	6.7	39 3	60.0
Savannah, Georgia.....	84.5	79.0	5.5	10 6	82.4
Smithville, North Carolina.....	84.0	78.6	5.4	11 1	83.3
Toledo, Ohio.....	76.6	72.1	4.5	11 7	71.6
Wilmington, North Carolina.....	83.0	76.2	6.8	18 8	79.7

* Record for 23 days.

† Record for 30 days.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for July, 1884, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 84.09 per cent. The percentages for the four elements are: Weather, 87.46; direction of the wind, 77.15; temperature, 86.05; barometer, 94.30 per cent. By geographical districts, they are: For New England, 78.82; middle Atlantic states, 86.25; south Atlantic states, 88.82; eastern Gulf states, 83.51; western Gulf states, 90.23; lower lake region, 84.00; upper lake region, 83.68; Ohio valley and Tennessee, 85.47; upper Mississippi valley, 84.08; Missouri valley, 72.98; north Pacific coast region, 87.10; middle Pacific coast region, 98.39; south Pacific coast region, 98.39. There was one omission to predict out of 2,997, or 0.03 per cent. Of the 2,996 predictions that have been made, thirty-nine, or 1.30 per cent., are considered to have entirely failed; one hundred and thirty-four, or 4.47 per cent., were one-fourth verified; three hundred and fifty-four, or 11.82 per cent., were one-half verified; six hundred and forty-one, or 21.40 per cent., were three-fourths verified; 1,828, or 61.01 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

CAUTIONARY SIGNALS.

During July, 1884, one hundred and twenty-two cautionary signals were ordered. Of these, ninety-seven, or 79.51 per cent., were justified by winds of twenty-five miles or more per hour at or within one hundred miles of the station. Twenty-

three cautionary off-shore signals were ordered, of which number fourteen or 60.87 per cent., were fully justified both as to direction and velocity. Twenty-three, or 100 per cent., were justified as to direction; and fourteen, or 60.87 per cent., were justified as to velocity. One hundred and forty-five signals of all kinds were ordered, one hundred and eleven, or 76.55 per cent., being fully justified. These do not include signals ordered at display stations where the velocity of the wind is only estimated. Of the above cautionary off-shore six were changed from cautionary. Five signals were ordered late. In one hundred and six cases, winds of twenty-five miles or more per hour were reported for which no signals were ordered; many of these were high local winds or strong sea breezes.

Professor T. C. Mendenhall, director of the "Ohio Meteorological Bureau," in his report for July, 1884, makes the following statement:

The verification of railway signals during July was as follows: for temperature, 93 per cent.; for state of the weather, 76 per cent.

The railway weather signals are now in use on all of the divisions of the Hocking Valley and Toledo railroad. It is hoped that they may be placed on other important lines very soon.

At the request of the Board of Trade of the City of Columbus, the signals will be displayed in their rooms in the City Hall, and arrangements are in progress for their display at one or two prominent points in the city.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroral displays occurred during July as follows:

Eastport, Maine: a brilliant auroral arch was seen from 1 to 2 a. m. of the 25th; the display consisted of a segment of dark haze surmounted by a whitish arch, and waves of light advancing to and receding from the zenith. A similar display was also observed from 9.20 to 11.30 p. m. of the same date.

Mount Washington, New Hampshire: an aurora, consisting of luminous beams extending upward 30°, was visible from 10.10 p. m. of the 3d until midnight. A faint auroral arch was also visible from 8.57 p. m. of the 25th to 1.20 a. m. of the 26th.

Point Judith, Rhode Island: a faint aurora was visible from 8.40 to 9.45 p. m. on the 14th, consisting of a diffuse light of pale straw-color, extending from north-northwest to north-northeast, and to an altitude of 30°; slender beams were observed from 9 to 9.20 p. m.

Portland, Maine: a faint auroral light was visible from 11.30 p. m. of the 19th to 12.20 a. m. of the 20th. On the 25th an irregular auroral arch with streamers extending to the upper edge of "Ursa Major" was observed from 9.20 to 11.50 p. m.

New Haven, Connecticut: an auroral glow, with a few faint streamers, was observed from 9 to 10.30 p. m. of the 26th.

Cambridge, Massachusetts: an auroral arch with streamers was observed about 9.15 p. m. on the 13th. A display was also observed on the evening of the 25th, and displays were suspected on the evenings of the 2d and 20th.

Rochester, New York: a faint auroral display, lasting only a few minutes, was observed at about 10 p. m. of the 19th. On the 25th a display covering the sky from northwest to northeast, and to an altitude of 45°, was observed from 9.15 to 11.30 p. m.

Oswego, New York: a faint auroral display, resembling the twilight, was observed in the north from 10 p. m. of the 19th until the early morning of the 20th.

Cresco, Iowa: faint auroral displays were observed on the evenings of the 15th, 19th, and 25th.

Monticello, Iowa: faint aurora from 9 to 10 p. m. of the 9th. Milwaukee, Wisconsin: a faint auroral light was observed in the north from 8.30 to 10 p. m. on the 13th, the display consisting of a luminous glow with slender beams shooting towards the zenith.

Alpena, Michigan: an aurora was visible from 8 to 11.40 p. m. of the 13th, consisting of a diffuse light in the north, from which pale streamers extended towards the zenith.

Escanaba, Michigan: a faint aurora was visible from 9.35

to 11.20 p. m. of the 13th. Another faint display occurred on the evening of the 19th.

Swartz Creek, Michigan: auroral streamers were observed during the evening of the 13th.

Moorhead, Minnesota: a faint auroral light was seen through the broken clouds at 10 p. m. of the 13th; at 11 p. m. the sky was entirely obscured. A broad auroral arch was observed in the north at 9.15 p. m. on the 19th, no streamers were visible; at 11 p. m. an indistinct light was still visible.

Thornville, Michigan: a faint auroral light was visible in the north on the evening of the 25th.

Sussex, Wisconsin: at 9.30 p. m. of the 20th an aurora was observed in the form of an arch, with a few streamers at its western extremity.

Madison, Wisconsin: a bright aurora was observed at 10 p. m. of the 13th, and an auroral arch with a few streamers was noted on the 24th, between 11.15 p. m. and midnight.

Duluth, Minnesota: an auroral arch was visible from 9.10 to 11.45 p. m. on the 19th; from 10.30 to 10.40 two complete arches were visible, well defined and very bright.

Saint Paul, Minnesota: a faint, straw-colored auroral light was visible from 9.45 to 11 p. m. of the 19th.

Fort Totten, Dakota: a brilliant auroral display occurred on the evening of the 13th. On the 19th a display consisting of shooting beams of pale yellow color was visible from 8.50 to 11.10 p. m. Displays also occurred on 24th, from 8.55 to 11.50 p. m., and on the 25th, from 8.50 to 11.33 p. m.

Fort Maginnis, Montana: an auroral light, covering 40° of the northern horizon and extending to an altitude of 30°, was observed from 10.30 to 11.45 p. m. of the 25th; long streamers advanced to and receded from the zenith with great rapidity during the display.

Dayton, Washington Territory: a pale green auroral light, with occasional streamers, was visible in the northern sky between sunset and 10.45 p. m., of the 24th.

Auroral displays, of which no descriptions have been received, were reported from various stations, as follows:

Winnipeg, Manitoba, 2d, 19th, 20th, 24th to 27th.

Wausau, Wisconsin, 3d.

Northfield, Minnesota, 11th.

Embarras, Wisconsin, 13th.

Fall River and Rowe, Massachusetts, 13th.

North Volney, New York, 13th.

Gardiner, Maine, 13th, 15th, 25th.

Manchester, Iowa, 13th, 15th, 19th, 25th.

Toronto, Ontario, 13th, 14th, 19th, 25th.

Allison, Kansas, 19th.

Traverse City, Michigan, 19th.

Prairie du Chien, Wisconsin, 19th, 25th.

Somerset, Massachusetts, 20th.

Sidney, Nova Scotia, 21st, 25th.

Halifax, Nova Scotia, 23d, 25th.

Bangor, Maine, 25th.

Contoocook, New Hampshire, 25th.

Garrettsville, Ohio, 25th.

Frederickton, New Brunswick, 25th.

Manistique, Michigan, 25th, 28th.

Ardenia, New York, 26th.

THUNDER-STORMS.

Thunder-storms have been reported in the different districts on the following dates:

New England.—1st to 14th, 18th to 21st, 23d, 26th, 30th, 31st.

Middle Atlantic states.—1st to 6th, 8th to 13th, 18th to 31st.

South Atlantic states.—1st to 7th, 10th to 20th, 22d to 31st.

Florida peninsula.—1st to 6th, 8th to 31st.

Eastern Gulf states.—1st to 7th, 9th, 10th, 11th, 13th to 18th, 22d to 31st.

Western Gulf states.—1st to 6th, 9th to 20th, 23d to 31st.

Rio Grande valley.—Rio Grande City, Texas: 12th.

Tennessee.—1st, 2d, 3d, 5th, 8th, 9th, 10th, 13th, 14th, 15th, 18th, 25th to 31st.

Ohio valley.—1st to 5th, 7th, 8th, 9th, 11th, 12th, 13th, 17th, 18th, 20th, 22d to 31st.

Lower lake region.—1st to 5th, 9th, 11th to 14th, 19th, 22d to 28th, 30th, 31st.

Upper lake region.—2d to 12th, 14th, 17th, 18th, 21st to 30th.

Extreme northwest.—1st, 3d, 4th, 7th, 8th, 9th, 14th, 15th, 20th to 26th, 28th, 29th, 31st.

Upper Mississippi valley.—1st to 5th, 7th to 15th, 17th, 18th, 21st to 30th.

Missouri valley.—1st to 4th, 6th to 30th.

Northern slope.—1st to 7th, 10th to 30th.

Middle slope.—1st to 21st, 23d to 30th.

Southern slope.—15th to 18th, 24th.

Southern plateau.—1st, 2d, 5th to 15th, 19th, 20th, 22d to 25th, 28th, 30th, 31st.

Middle plateau.—5th, 9th, 11th to 15th, 20th, 24th, 28th.

Northern Plateau.—10th to 15th, 17th, 20th, 25th, 26th.

North Pacific coast region.—6th, 11th, 17th, 25th, 27th.

Middle Pacific coast region.—Red Bluff, Hydesville, and Blue Lake, California: 12th.

South Pacific coast region.—Yuma, Arizona: 7th, 14th.

ATMOSPHERIC ELECTRICITY INTERRUPTING TELEGRAPHIC COMMUNICATION.

Fort Assinaboine, Montana, 7th, 15th, 20th, 21st.

Fort Bowie, Arizona, 1st.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos were observed in the different districts on the following dates:

New England.—4th, 7th, 11th, 14th, 15th, 17th, 18th, 20th, 27th, 28th, 30th.

Middle Atlantic states.—6th, 7th, 12th, 18th, 30th, 31st.

South Atlantic states.—1st, 2d, 5th, 6th, 7th, 13th, 21st, 24th, 31st.

Florida peninsula.—2d, 10th, 21st, 23d, 27th, 29th.

Eastern Gulf states.—3d, 10th, 11th, 14th, 16th, 17th, 18th.

Western Gulf states.—4th, 7th, 16th, 21st, 24th, 26th.

Tennessee.—5th, 13th, 20th, 30th.

Ohio valley.—6th, 17th, 26th, 30th.

Lower lake region.—2d, 9th, 11th, 23d, 26th, 27th.

Upper lake region.—3d, 7th, 11th, 19th, 22d, 26th.

Extreme northwest.—1st, 10th.

Upper Mississippi valley.—15th, 16th, 20th, 21st, 22d, 25th, 28th, 29th.

Missouri valley.—9th, 11th, 18th, 21st.

Middle slope.—3d, 9th.

Middle plateau.—10th, 14th.

Northern plateau.—10th.

North Pacific coast region.—8th, 12th.

Middle Pacific coast region.—4th, 9th, 10th, 17th, 20th, 25th.

LUNAR HALOS.

Lunar halos were observed in the different districts on the following dates:

New England.—4th.

Middle Atlantic states.—3d, 4th, 5th, 8th, 29th, 30th, 31st.

South Atlantic states.—1st, 2d, 5th, 6th, 30th, 31st.

Florida peninsula.—5th, 9th, 27th, 29th, 31st.

Eastern Gulf states.—4th, 9th, 10th, 29th.

Western Gulf states.—2d, 4th, 9th, 30th.

Tennessee.—31st.

Ohio valley.—5th, 11th, 29th, 30th.

Lower lake region.—1st, 3d, 4th, 12th, 28th, 31st.

Upper lake region.—1st, 3d, 28th, 31st.

Extreme northwest.—29th.

Upper Mississippi valley.—1st, 3d, 7th.

Missouri valley.—2d, 4th, 5th, 30th.

Middle slope.—2d, 9th.

Southern slope.—5th.

Southern plateau.—28th, 29th.

Middle Pacific coast region.—9th.

MIRAGE.

Webster, Day county, Dakota: a mirage appeared at sunrise on the 25th, plainly showing the town of Bristol, eleven miles west of Webster.

Mirage was also observed at Traverse City, Michigan, on the 20th, and at Salina, Kansas, on the 31st.

MISCELLANEOUS PHENOMENA.

SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hundred and fifty-nine stations show 4,891 observations to have been made, of which five were reported doubtful; of the remainder, 4,886, there were 3,995, or 81.8 per cent., followed by the expected weather.

SUN SPOTS.

Professor David P. Todd, director of the Lawrence Observatory, Amherst, Massachusetts, furnishes the following record of sun spots for July, 1884:

Date— July, 1884.	No. of new		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		Remarks.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
4, 11 a. m.	3	42					7	85	Many of the spots small.
5, 3 p. m.	0	0	1	15	0	0	0	50	
7, 4 p. m.	1	3	1	10	1	3	6	45	
9, 4 p. m.	0	10	2	30			4	25	
10, 5 p. m.	1	3	2	3	1	3	3	20	
13, 4 p. m.	0	10	0	0	0	0	3	30	
14, 5 p. m.	0	5	0	3	0	0	3	35	
15, 4 p. m.	0	5	1	1	0	0	2	40	
16, 6 p. m.	1	2	0	5	1	2	3	30	
17, 11 a. m.	0	0	0	5	0	0	2	20	
19, 11 a. m.	1	2	0	15	1	2	3	4	
20, 5 p. m.	1	3	1	1	1	3	3	0	
21, 5 p. m.	1	5	0	0	1	2	4	12	
22, 12 m.	0	8	0	0	0	0	4	20	
23, 4 p. m.	0	5	0	0	0	0	4	25	
27, 5 p. m.							3	30	
30, 9 a. m.							3	25	

Faculae were seen at the time of every observation. †Approximated.

Sycamore, New York: on the 21st several sun spots were observed, two of which were large and black.

DROUGHT.

Fort Davis, Texas: the "water-holes" in this part of the state are rapidly drying up. The grass is badly scorched and cattle are suffering in consequence of poor pasturage.

Reports from Cantonment, Indian Territory, on the 14th, stated that the corn crop in that region was suffering for rain.

Galveston, Texas, 14th: reports from San Antonio state that the sheep and cattle raising interests in the western part of Texas, are suffering from the effect of the prolonged drought. The streams on the American side of the Rio Grande river are reported to be dry.

Dodge City, Kansas, 17th: drought has caused injury to the crops in this part of the state.

Wauseon, Fulton county, Ohio: for thirty-two days preceding July 23d, only 0.26 inch of rain fell; much inconvenience resulted from scarcity of water.

Wausau, Marathon county, Wisconsin: from the 4th to 22d the weather was unusually dry; small streams dried up, and the water in the Wisconsin river reached a very low stage; vegetation suffered from lack of rain; a heavy fall of rain occurred on the 22d.

Thornville, Lapeer county, Michigan: from the beginning of the month until the 23d, the weather was very dry; after the 23d the rains were plentiful.

The following extracts are from the Pittsburg "Daily Post" of July 26, 1884.

CINCINNATI, Ohio, July 24.—Up to the first day of July the season in the Ohio valley, within a radius of two hundred miles from Cincinnati, was highly favorable for all the crops. There were frequent rains and the temperature was in every way such as to promote the growth of the crops. Since that date there has been no general rain in this region, and the local showers have been limited to small areas and have been infrequent and insufficient.

All through southern Ohio and Indiana and northern Kentucky the wagon roads are covered with dust. Wheat is all harvested and the most of it has been threshed. The dry weather has been favorable for harvesting and threshing. Early sown oats have escaped injury, but the late sown are suffering. Hay, which the rains of the spring months and of June set so thick on the ground, has had its growth checked by the July drought. Corn is the greatest sufferer of all the grains. In a few fields of low, irrigated bottom lands the corn looks vigorous and thrifty, but everywhere else, in upland and lowland, the outlook is already discouraging and is growing more so every day. Corn, in lands that usually yield from forty-five to seventy-five bushels per acre, is now not more than three or four feet high and in full tassel. Should seasonable weather set in and continue from this time forward, such corn might yield three-fourths of the average crop. On the other hand, if the present drought should continue eight or ten days longer no change of season for the better afterward could save the crop. One-half of it would scarcely be worth cutting for fodder, and the other half would average not more than a third of the usual yield. Most of the few showers that have fallen since the first of this month have been within a few miles of the Ohio river, as was that of yesterday. Further north, in Ohio and Indiana, and further south, in Kentucky, the drought has been unmitigated. Potatoes and garden stuff have been seriously checked in their growth. To aggravate the situation, the common meadow grasshoppers have increased in a few small areas in the most seriously parched regions, where they have invaded gardens and vineyards and cut down everything before them. The large streams have shrunk to rivulets and the brooks and marshy lands are drying up, endangering the existence of live stock. Sparks from locomotives fire the dead grass along the railways. A good rain, spreading over a wide stretch of country, within three or four days, would be worth millions of dollars to this part of the Ohio valley, and the continuance of good, seasonable weather until the 1st of September, would be worth millions of dollars more.

CINCINNATI, Ohio, July 25.—Rain fell at Indianapolis and in the belt eastward through central Ohio as far as Wheeling last night, but none fell here and in southern Ohio. A report from Youngstown says the drought has caused considerable loss to farmers. Those along the railroads watch night and day to prevent fire. A Germantown, Butler county, special says that region is scourged with the severest drought for years. The tobacco crop is very much injured and corn threatened. The crops of wheat, oats, and hay are unusually fine.

Lancaster, Fairfield county, Ohio: during the night of the 24-25th an abundant rain fell here, which was the first precipitation of any consequence that had occurred since the 4th. The corn, which had been looking well, began to shrivel up and many farmers were apprehensive that the quality would be inferior. The rainfall above-mentioned has placed the crop beyond danger, and an unprecedented yield is now promised.

Wapakoneta, Auglaize county, Ohio: prior to the abundant rains of the 25th the crops, especially the corn and potatoes, in this county suffered from drought.

Springfield, Clark county, Ohio: the long-continued and damaging drought which prevailed in this county was terminated by a heavy rainfall on the 25th.

Mount Gilead, Morrow county, Ohio: all kinds of crops, especially corn, suffered serious injury from the protracted drought which prevailed up to the 24th. Rain began to fall at 3 p. m. of that date and continued during almost the entire night and was of great benefit to farming interests.

Montgomery, Alabama: reports on the 26th from various localities adjacent to this place stated that the cotton crop was suffering serious injury from drought.

Toledo, Ohio, 31st: although the crops in this part of the state were injured by the extremely dry weather during the early part of the month, they were revived by subsequent rains, and at the close of the month were in promising condition.

Edgington, Rock Island county, Illinois: the rains of July in this county were light and of local character; in some localities the crops are suffering from drought.

Fort Madison, Lee county, Iowa: the month was very dry in this locality; only 1.41 inches of rain fell at Fort Madison.

Syracuse, New York, 31st: the weather during the month was very dry in this part of the state, and corn has suffered seriously in consequence.

METEORS.

Bordentown, Burlington county, New Jersey: at 8.20 p. m. of the 3d a meteor apparently rose from beneath the horizon and slowly passed from north-northeast towards the north-northwest, in a direct line over from 50° to 60°, at an altitude

of about 40° , being in view from five to ten seconds. It appeared to be about one-third the size of the moon, the forward portion of the body being a fiery red, the center a reddish purple verging to blue at the rear, with a tail of bright blue nearly 20° in length, tapering to a sharp point at the end farthest from the body.

A meteor, evidently the same as that above described, was observed at various points in Canada, western New York, New England, and the middle Atlantic states, as will be seen from the following reports:

Cazenovia, Madison county, New York: At 8.25 p. m. of the 3d, a brilliant meteor passed from above the pole star to the western horizon, leaving a trail that remained visible for several minutes.

Reports from Oswego state that the above meteor was seen by many persons at that place.

State College, Centre county, Pennsylvania: a brilliant meteor was observed on the evening of the 3d; it resembled a rocket in appearance and disappeared in the northwestern sky.

Palermo, Oswego county, New York: an unusually bright meteor was observed passing to the westward at 8.30 p. m. on the 3d; it left a trail which remained visible for several minutes.

North Volney, Oswego county, New York: a very large and brilliant meteor, passing in a westerly direction, was observed on the evening of the 3d.

Bethel, Fairfield county, Connecticut: at 8.25 p. m. of the 3d a meteor of remarkable brilliancy was seen in the northern sky; it appeared to pass almost horizontally from east to west, leaving a bright trail, 30° of which were visible at the same moment. Before disappearing, the course of the meteor was more inclined toward the horizon, and it disappeared behind some intervening trees. When first observed its altitude was about 45° and when last observed about 15° . The phenomenon was one of the most remarkable of its kind ever witnessed by the observer.

Fort Myer, Virginia: a brilliant meteor was seen in the northern sky at 8.25 p. m. of the 3d; it was visible five seconds and moved in a westerly direction, producing a bright light.

The following extract is from the Canadian Weather Review for July, 1884:

A magnificent meteor was seen on the night of the 3d at 8.27 p. m., standard time, passing from southeast to northwest—colors brilliant red and green. Two distinct explosions are reported to have been heard. After the first explosion a sinuous streak remained visible until covered by clouds; the time of flight was from seven to eight seconds, and the apparent size about one-fourth that of the moon. Reports have been received from Listowel, Hastings, Beatrice, Belleville, Lakefield, Pembroke, Peterborough, Kingston, Deseronto, Lindsay, and Huntingdon, all substantially agreeing as to course, size, &c. It passed two or three miles south of Belleville, and about the same distance north of Lindsay.

Pittsburg, Pennsylvania: a very bright meteor was observed at 2.48 a. m. of the 20th; it moved from the zenith towards the northern horizon, leaving a reddish cloud which floated northward. Another bright meteor, passing across the sky from east to west, was seen at 8.50 p. m. of the 30th.

The following extract is taken from the "Manhattan (Kansas) Republic," of July 18th:

A Kansas City, Missouri, special from Saint Mary's says: A remarkable meteorite fell last Friday night, the 11th, in the grounds of the Saint Mary's college, near this city. The professor has secured the fragments, and finds them to contain metals which make this one of the most precious in the world; only three others of this kind are certainly known to have fallen on this planet, one at Agram, in Europe, in 1751; another in Dickson county, Tennessee, in 1835, and a third at Brennan, Texas, in 1847.

Sacramento, California: a bright meteor was seen at 9.10 p. m. of the 21st, passing northward in the constellation of the "Great Bear."

Anna, Union county, Illinois: two brilliant meteors passing from northeast to southwest, were observed at 9.40 p. m. of the 23d; one of them was especially bright, and illuminated the surrounding country, the light being sufficiently strong to cast shadows.

Fort Macon, North Carolina: a very bright meteor was observed passing across the sky from east to west at 11.30 p. m. of the 24th.

Meteors were also observed at the following places:

Oswego, New York, 3d.

Ardenia, New York, 3d, 30th.

Prescott, Arizona, 4th.

Prairie du Chien, Wisconsin, 5th.

Davenport, Iowa, 10th, 12th, 23d, 24th, 26th, 27th.

Stateburg, South Carolina, 13th, 14th, 15th, 16th, 21st, 22d; one or more conspicuous meteors were observed on every clear evening after the 12th.

Variety Mills, Virginia, 19th, 20th.

Scott's Hill, North Carolina, 21st.

Chapel Hill, North Carolina, 22d.

Woodstock, Maryland, 23d, 27th, 29th.

Red Willow, Nebraska, 24th.

Allison, Kansas, 28th, 29th, 30th.

Burlington, Iowa, 30th.

Lancaster, Wisconsin, 31st.

WATER SPOUTS.

Toledo, Ohio: the steamer "Evening Star" reports having observed a water-spout on Lake Erie between 7 and 8 p. m. of the 30th, when near Toledo. There was but little wind and a calm sea at that time, but a severe hail squall occurred about ten minutes before the water-spout was observed. The water-spout consisted of a huge column inclined at an angle of 80° or 90° ; it was about one mile distant from the steamer when observed, and was moving in an easterly direction.

The following extract is taken from the "Saint Louis Globe-Democrat" of July 26, 1884:

The storm late yesterday afternoon showed many of the characteristics, in its coming, of the approach of a tornado. The clouds seemed to approach from the southeast and also from the southwest, but the greatest force was from the former direction. At 4.30 the sky was filled with clouds, but beneath them there appeared a separate installment of lighter colored clouds assuming all kinds of fantastic shapes. They moved to a centre north and west of the city, where they seemed to lose energy, as the agitation and fantastic motion apparently decreased. Passengers on the ferryboats about 5 o'clock, when the rain had begun to fall, saw the most interesting manifestation of the storm. The water opposite the foot of Anna street became violently agitated, and while spectators were wondering what caused the disturbance, a cloud, shaped like an inverted cone, moved over it, and the water rose in a cone to meet it, but as the two cones came together the oblique lines of the two sides became nearly vertical. It was a water-spout, and its movement was very rapid in a northeasterly direction. Opposite the foot of Choteau avenue the spout left the river near the Pittsburg dike, and added to its bulk a large amount of sand from the shore. It passed over the Pittsburg Transfer Stables, the east end of which was torn from its foundation and thrown through the engine house. The roof of the engine house was taken off and many pieces were carried to the Little Rolling Mills, a mile away. Here the column lost its force and power of motion. It was precipitated in a torrent of rain, which covered the streets. An eyewitness reports that it appeared to be about five hundred feet in diameter and had a rapid rotary motion, producing a sound like distant thunder. For a few seconds the air seemed to be motionless, when suddenly the column swept across toward the Pittsburg engine house and stables, damaging them as described above.

A TIDAL WAVE.

MILWAUKEE, WISCONSIN, July 24, 1884.—A tidal wave was felt to-day in the Menomonee and Milwaukee rivers. It was most noticeable at the "Straight Cut," as the entrance to the river is called, where the waters receded three feet, returning again in about fifteen minutes. Above the dam in the Milwaukee river, from two to three miles from the "Straight Cut," swimmers who were standing in shallow water were completely submerged by the returning waters.

EARTHQUAKES.

San Francisco, California: a slight earthquake shock is reported to have been felt at about day-light on the 15th, the vibration being from east to west.

The following extract is from "Nature," of July 24, 1884:

During the night of July 19th an earthquake was felt at Agram. It lasted four seconds, and was accompanied by subterranean rumblings. No damage was done.

The following extracts are from "The New York Herald" of July 24th and 26th, respectively:

LONDON, ENGLAND, July 23, 1884.—A very perceptible shock of earth-

quake occurred to-day on the island of Ischia, in the Mediterranean sea. The inhabitants were greatly agitated as they feared an explosion from the long extinct volcano, Mount San Nicolo.

CAIRO, EGYPT, July 25, 1884.—It is reported that an earthquake has occurred at Massowah, on the Red sea. Nearly all the houses in the city were destroyed, and the ships in the harbor were violently rocked. The inhabitants were panic stricken and fled to the interior.

POLAR BANDS.

Lead Hill, Arkansas, 14th, 31st.
Los Angeles, California, 27th.
Archer, Florida, 2d, 3d, 6th, 12th, 13th, 17th, 20th, 23d, 24th, 27th, 28th.
Laconia, Indiana, 29th.
Wabash, Indiana, 7th, 16th.
Salina, Kansas, 24th.
Maud, Kansas, 21st.
Gardiner, Maine, 7th.
Escanaba, Michigan, 30th.
Mountainville, New York, 12th, 15th.
Wauseon, Ohio, 1st, 2d, 28th.
Leetsdale, Pennsylvania, 10th.
Wytheville, Virginia, 6th, 12th, 15th, 22d.
Variety Mills, Virginia, 3d, 14th.

PRAIRIE AND FOREST FIRES.

Kingston, Ontario: extensive fires were burning in several of the adjacent townships on the 2d. The largest of these fires covered an area three miles wide and about twenty miles long. One million feet of lumber were burned. The country was so dry that the fires spread with great rapidity.

Forest fires also occurred in the vicinity of Carson City, Nevada, on the 6th, and in the vicinity of Fort Buford, Dakota, on the 27th.

ZODIACAL LIGHT.

Archer, Florida, 18th, 22d, 23d.
Cantonment, Indian Territory, 10th.
Indianapolis, Indiana, 22d.
Fall River, Massachusetts, 15th.
Escanaba, Michigan, 16th.
Nashville, Tennessee, 20th to 24th.

SAND STORMS.

Fort McDowell, Arizona, 7th, 8th.
Yuma, Arizona, 15th.
West Las Animas, Colorado, 1st.
Boisé City, Idaho, 28th.

MIGRATION OF BIRDS.

Geese flying northward.—Cape Henry, Virginia, 19th.
Ducks flying southward.—Portland, Oregon, 23d.

NOTES AND EXTRACTS.

REPORT OF THE ALABAMA WEATHER SERVICE, UNDER DIRECTION OF PROFESSOR P. H. MELL, JR.

MECHANICAL AND AGRICULTURAL COLLEGE,
AUBURN, ALABAMA, August 1, 1884.

Although there have been oppressive and sultry days the month of July has sustained quite a uniform temperature, and the nights have generally been cool and comfortable. The heat in some sections, however, has been keenly felt, because the atmosphere was so saturated with moisture as to prevent rapid evaporation from the body. The thermometer ranged as high as 100° at only four stations.

The state has been visited by copious showers and in some sections the rains have been unusually heavy. The farming interests, however, have suffered but little, and the prospects for a fine crop are very flattering.

State summary.

Mean temperature, 80°·5; highest temperature, 104° at Troy, on the 25th; lowest temperature, 54° at Selma, on the 8th; range of temperature for the state, 50°; greatest monthly ranges at stations, 35° at Troy and 41° at Calera; least monthly range of temperature, 14° at Lafayette and 25° at Auburn; greatest daily ranges at stations, 38° at Celera, 35° at Selma on the 8th, and 27° at Gadsden on the 21st; least daily ranges, 0° at Union Springs on the 10th, 0° at Florence on the 15th, 0° at Carrollton on the 28th, and 9° at Mobile on the 23d.

Mean depth of rainfall, 5.47 inches; mean daily rainfall, 0.186 inch; largest monthly rainfall, 12.02 at Green Springs; least monthly rainfall, 0.41 at Fort Deposit; greatest daily average for the state, 1.10 inches, on the

28th; largest daily rainfall at stations, 3.50 inches at Carrollton, 3.10 at Scottsborough, and 3.50 inches at Wetumpka, all on the 28th.

Days of general rainfall, 14th, 15th, 25th to 29th; average number of days on which rain fell, 11, average number of cloudy days, 10.3; fair days, 13.5; clear days, 7.2.

Warmest day, 5th; coolest day, 8th.

Prevailing winds, west and northwest; greatest force of wind reported from Marion on the 13th—45 miles per hour from the west; Mobile reports on the 6th, 28 miles per hour from the southeast.

The following meteorological summary is taken from the report of Hon. J. T. Henderson, Commissioner of Agriculture, for the state of Georgia:

Districts.	Temperature.			Precipitation.
	Mean of maximum.	Mean of minimum.	Monthly mean.	
Northern Georgia.....	94.5	58.3	77.2	4.59
Middle Georgia.....	95.7	64.0	80.4	3.34
Southern Georgia.....	94.0	72.0	83.0	6.25
Southeastern Georgia.....	91.8	69.5	80.2	2.72
Eastern Georgia.....	95.5	64.5	82.2	3.31
Means for state.....	94.3	65.7	81.2	4.04

The following meteorological summary is from the July report of the "Illinois Weather Service," under direction of Mr. S. D. Fisher:

Districts.	Temperature.			Precipitation.	Average number of rainy days.
	Mean of maximum.	Mean of minimum.	Monthly mean.		
Northern counties.....	89.8	54.1	71.1	5.97	11
Central counties.....	92.1	59.2	73.5	3.62	12
Southern counties.....	95.0	64.3	76.8	3.97	10
Averages for state.....	92.3	59.2	73.8	4.52	11

The following meteorological summary is taken from the July report of the "Indiana Weather Service:—"

Districts.	Temperature.			Precipitation.
	Mean of maximum.	Mean of minimum.	Monthly mean.	
Northern counties.....	90.0	56.7	73.6	3.98
Central counties.....	90.2	57.3	72.4	4.99
Southern counties.....	92.1	58.6	74.6	4.74
Averages for state.....	90.8	57.5	73.6	4.57

IOWA WEATHER BULLETIN, FOR JULY, 1884.

July, 1884, was fair, cool and calm, with moderate excess of rainfall.

The mean temperature was two degrees below normal; during the past forty-five years, the July temperature has been as much, or more, below normal in sixteen years. The first and second decades were decidedly cold, being three and four and a half degrees below normal; but the third decade was hot, being one and a half degrees above normal. The 17th was the coldest day, being 11° below normal; the 23d was the hottest day with 10° above normal. The black bulb sun thermometer averaged 48°·4 above the air temperature at noon, and reached 154° on the 23d.

The mean cloudiness was nearly normal, but the number of clear days was high.

The number of thunderstorms was high, and several were quite severe, locally accompanied with high wind or hail. The most extended of these was the squall of the afternoon and evening of the 11th, extending from Palo Alto to Johnson counties, and considerable damage was done in a narrow belt from Hamilton county southeast, by hail. The thunderstorm of the evening of the 23d and early morn of the 24th was most severe from Dallas to Marion counties. The thunderstorm of the evening of the 4th was most severe in middle eastern Iowa. Three very small tornadoes reached the ground over a short distance in Sioux City, Woodbury county; near Denison, Crawford county, and near Hubbard, Hardin county. This brings the latest summer date of tornadoes in Iowa two days further; but the damage done to life and property by these tornadoes was less than what lightning and hail did during the same storm in other parts of Iowa.

For the state at large, the weather has been favorable. No continued rains having occurred, haying has been interfered with but little, and har-

vesting is progressing finely; the timely showers and intense insolation during the month, with hot weather during the last decade, have added immensely to the corn prospect, which has not been as good as now in Iowa for several years.

GUSTAVUS HINRICHS.

CENTRAL STATION, I. W. S., August 1, 1884.

Professor J. T. Lovewell, director of the Kansas Weather Service, furnishes the following meteorological summary of observations made at Washburn College, Topeka:

Temperature of the air.	June 20th to 30th.	July 1st to 10th.	July 10th to 20th.	Mean.
Minimum and maximum averages.				
Minimum.....	68.	62.	66.
Maximum.....	96.	85.	97.
Minimum and maximum.....	82.	73.5	83.
Range.....	28.	23.	31.
Tri-daily observations.				
7 a. m.....	72.4	71.3	71.7	71.8
2 p. m.....	86.5	87.0	84.8	86.1
9 p. m.....	73.2	75.4	75.4	74.7
Mean.....	77.4	77.4	79.4	77.1
Relative humidity.				
7 a. m.....	.89	.80	.88	.86
2 p. m.....	.69	.55	.70	.65
9 p. m.....	.85	.77	.85	.81
Mean.....	.82	.71	.81	.78
Pressure as observed.				
7 a. m.....	29.034	28.965	29.023	29.004
2 p. m.....	28.990	28.948	28.991	28.976
9 p. m.....	28.993	28.949	29.020	28.987
Mean.....	28.006	28.954	29.011	28.989
Miles per hour of wind.				
7 a. m.....		9.8		
2 p. m.....		12.6		
9 p. m.....		7.5		
Total miles.....	1630	2413	1994	6007
Cloudiness, by tenths.				
7 a. m.....	4.4	4.7	4.6	4.6
2 p. m.....	4.7	2.5	4.5	3.9
9 p. m.....	2.6	3.0	4.3	3.3
Rain				
Inches.....	2.29	1.78	2.73	6.80

REPORT OF LOUISIANA STATE WEATHER SERVICE, UNDER DIRECTION OF MR. ROBERT S. DAY.

The weather, except for the high temperature, was without any special feature. The hot wave was present all over the state, reaching extreme figures in the northwestern parishes. At Minden nineteen days out of the month the mercury was over 100°; at Shreveport the thermometer registered over 100° on fourteen days. This has been the hottest July for twelve years. The low lands have had cooler days but warmer nights, the daily range appearing greatest on the uplands.

On the 10th a heavy storm, with vivid electric phenomena, occurred at Donaldsonville.

A heavy wind storm from the west, velocity thirty-seven miles per hour, occurred at New Orleans on the 26th.

Thunder storms occurred at New Orleans on the 6th, 7th, 10th, 15th, and 26th.

Crops are reported excellent on the low lands, but they need rain on the hills and prairies.

State summary.

Mean temperature, 84° 6, against 78° 5 for June; highest temperature, 106° at Minden, on the 8th; lowest temperature, 59° at Opelousas, on the 28th; greatest daily range of temperature, 38° at Alexandria, on the 1st; least daily range of temperature, 8° at Natchitoches, on the 18th.

Average rainfall, 2.40 inches; greatest daily rainfall, 2.04 inches at Opelousas, on the 24th; largest monthly rainfall, 4.88 inches at Lafayette.

Average number of rainy days, 5.6.

The Mississippi river at New Orleans fell three feet ten inches during the month; and the Red river at Shreveport fell eleven feet and two inches.

The following extract is from the "Michigan Crop Report" for July, 1884, prepared under the direction of the State Secretary:

The weather during harvest time was exceptionally fine. The rainfall at Lansing during July amounted to 3.24 inches, as compared with 10.12 inches for July, 1883. The weather during the last week of the month was unusually cool for the time of year. Light frosts were observed on the mornings of the 8th and 9th.

The Chief Signal Officer has received a valuable report on the principal meteorological conditions in Michigan during the year 1882, by the Michigan state board of health, Dr. Henry B. Baker, secretary.

REPORT OF THE MISSOURI WEATHER SERVICE, JULY, 1884.

The mean temperature during the past month has been 77° 6, which is 1° 6 below the normal for July at Saint Louis. The daily means were with very little range during the whole month.

The mean daily range was 15° 4, with small ranges on the 5th, 15th, and 17th.

The maximum temperatures were generally observed on the 8th of the month, with some few exceptions for the 23d.

The minimum temperature at the central station was observed on the 14th. The range of the minimum temperatures was remarkably small, the mean minimum being 69° 9.

The rainfall at the central station was 2.94 inches, which is 1.22 inches below the normal amount for July. This amount, however, has generally been exceeded in the other parts of the state, Hannibal, Keokuk, and Mascoutah, only, registering as low or below. The largest amount has been in the central part of the state, with larger amounts in the southeastern, central-southern, and northwestern portions. A remarkably heavy rainfall was observed at Miami on the 13th, 5.25 inches falling in twelve hours.

In some parts of the state there has been a great number of thunderstorms, generally in the vicinity of the Missouri and Mississippi rivers.

Hail fell at Ironton on the 5th, at Chamois on the 5th and 15th, at Mexico on the 12th, and at Miami, with damaging results to the corn crop, on the 27th.

Glasgow and Lexington report that the large amounts of rain did damage to the wheat in the shock and the hay. The corn and tobacco crops are generally reported as doing finely, the corn in some localities being extra fine and beyond the danger of drouth.

A. RAMEL,

Assistant in charge.

Washington University, August 8, 1884.

NEBRASKA WEATHER BULLETIN, JULY, 1884.

The general character of the month was cool, with rainfall considerably above the normal.

Rainfall.—The average by sections was as follows: southeast, 7.40 inches; northeast, 6.07 inches; southwest, 7.85 inches; northwest, 4.27 inches; average for the entire state, 6.55 inches.

Relative humidity.—Mean relative humidity at Omaha, 65.0 per cent; North Platte, 70.9 per cent; De Soto, 82.7 per cent.

Temperature.—The mean temperature of the air was 74.6. The average of all noon observations was 83.8. The following are some of the maximum and minimum temperatures:

Stations.	Max. temperature.	Min. temperature.
Omaha.....	97.3	57.5
North Platte.....	97.0	55.0
De Soto.....	96.0	55.0
Crete.....	95.6	52.4

Wind.—Number of miles traveled: Omaha, 5,385; North Platte, 7,187; Crete, 7,498. Highest velocity: Omaha, 42 miles, from north; North Platte, 47 miles, from west; Crete, 50 miles, from north.

Hail.—Hail was reported at Superior on the 30th; Marquette on the 20th; Dawson on the 29th; Stromsburg on the 13th and 27th, and Fremont on the 18th.

The following extract is from "The New Jersey Weather Review" for July, 1884, prepared under the direction of Mr. W. Earle Cass, of Newark:

The temperature ranged from 97°, at Salem, to 54°, at Newark and Lambertville; the mean temperature of the state, as represented by twelve stations, being 70° 97, which is several degrees below the average of past years.

The rainfall varied from 2.20 inches at Salem to 6.48 inches at Paterson; the average for eighteen stations being 4.96 inches. The rainy days ranged from seven to seventeen in different parts of the state.

Warm days (between 65° and 84°), about twenty-three in number. Hot days (maximum temperature between 85° and 95°), about seven. No very hot days were reported (maximum temperature over 95°).

Prevailing wind, southwest to northwest.

REPORT OF THE OHIO METEOROLOGICAL BUREAU, JULY, 1884

The atmospheric pressure for the month of July was somewhat lower than during the corresponding month of last year. The difference is approximately one-tenth of an inch, alike for the mean, the maximum, and the minimum. The lowest barometer was recorded on the last day of the month, and no extraordinary fluctuations are reported.

The temperature was, on the whole, somewhat lower than for July of last year. The mean temperature was 71° 5 against 72° 1 for last year. The highest temperature observed was 96° 0, at Waverly, the maximum for the same month of last year being 97° 8. The minimum temperature, which was 41°, recorded at Lebanon, was more than 2° lower than that of July, 1883.

The noticeable feature of the weather for the month was the absence of rain during the greater part of it. During the last third of the month of June and nearly all of July, very little rain fell, the severe drought extending over nearly all of the state. Heavy rains occurred very generally during the last week of July, and the total precipitation for the month, as shown in the summary, was brought nearly up to that of last year, and somewhat above the normal amount for July.

The prevailing direction of the wind was from the northwest.

State summary.

Mean barometer, 29.900 inches.
 Highest barometer, 30.279 inches, on the 3d at Jefferson.
 Lowest barometer, 29.569 inches, on the 31st at Jefferson.
 Range of barometer, .710 inch.
 Mean relative humidity, 79.1 per cent.
 Mean temperature, 71°.5.
 Highest temperature, 96°.0, on the 24th at Waverly.
 Lowest temperature, 41°.0, on the 21st at Lebanon.
 Range of temperature, 55°.0.
 Mean daily range of temperature, 21°.7.
 Greatest daily range of temperature, 49°.5, on the 22d at O. S. University.
 Least daily range of temperature, 3°.0, on the 19th at Jefferson.
 Number of clear days, 11.7.
 Number of fair days, 14.2.
 Number of cloudy days, 5.1.
 Number of days on which rain fell, 19.5.
 Mean rainfall, 3.83 inches.
 Average daily rainfall, .123 inch.
 Greatest rainfall, 6.60 inches, at Junction.
 Least rainfall, 1.70 inches, at College Hill.

REPORT OF THE TENNESSEE WEATHER SERVICE, JULY, 1884, UNDER DIRECTION OF HON. A. J. M'WHIRTER.

The weather during July presented many unusual features, the chief of which were the extraordinary electrical disturbances and the amount of rainfall. The storms which prevailed were, many of them, general in their character, and some of them, notably those of the 5th, 9th and 30th, were quite destructive to the growing crops. The mean temperature for the

month was 76°, which is 4° above that for the preceding month, and 2° above that for July, 1883. The highest temperature was 99°, which is 1° above July, 1883; the lowest was 46° or 10° below July of last year; the mean of the maximum and minimum temperatures differed very slightly from those of 1883. The high temperatures were general about the 5th and 24th, and the low temperatures about the 7th. The average rainfall for the month was 5.55 inches, which is 0.25 inch greater than that for the preceding month, and 1.67 inches greater than that for July, 1883, which was itself an unusual amount for July. The days of greatest rainfall were the 4th, 9th, 15th, 18th, and from the 25th to 31st inclusive. The greatest daily rainfall occurred on the 31st, when an average of 1.03 inches fell throughout the state. Many of these rains were general, and many of them were accompanied by severe electric storms.

State summary.

Mean temperature, 76°; highest temperature, 99°, on the 4th, at Hohenwald, and on the 9th at Woodstock; lowest temperature, 46°, on the 21st, at Andersonville; range of temperature, 53°; greatest daily range of temperature, 36° on the 21st, at Andersonville, and on the 23d at Hohenwald; least daily range of temperature, 0° on the 30th, at Franklin, and 1° on the 26th at Kingston Springs, and on the 30th at Hardison's Mills. Mean depth of rainfall, 5.55 inches; mean daily rainfall, .179 inch; greatest rainfall, 10.62 at Manchester; least rainfall, 1.98 at Woodstock. Average number of clear days, 9; fair days, 13; cloudy days, 9; average number of days on which rain fell, 11.6. Prevailing winds, west and southwest.

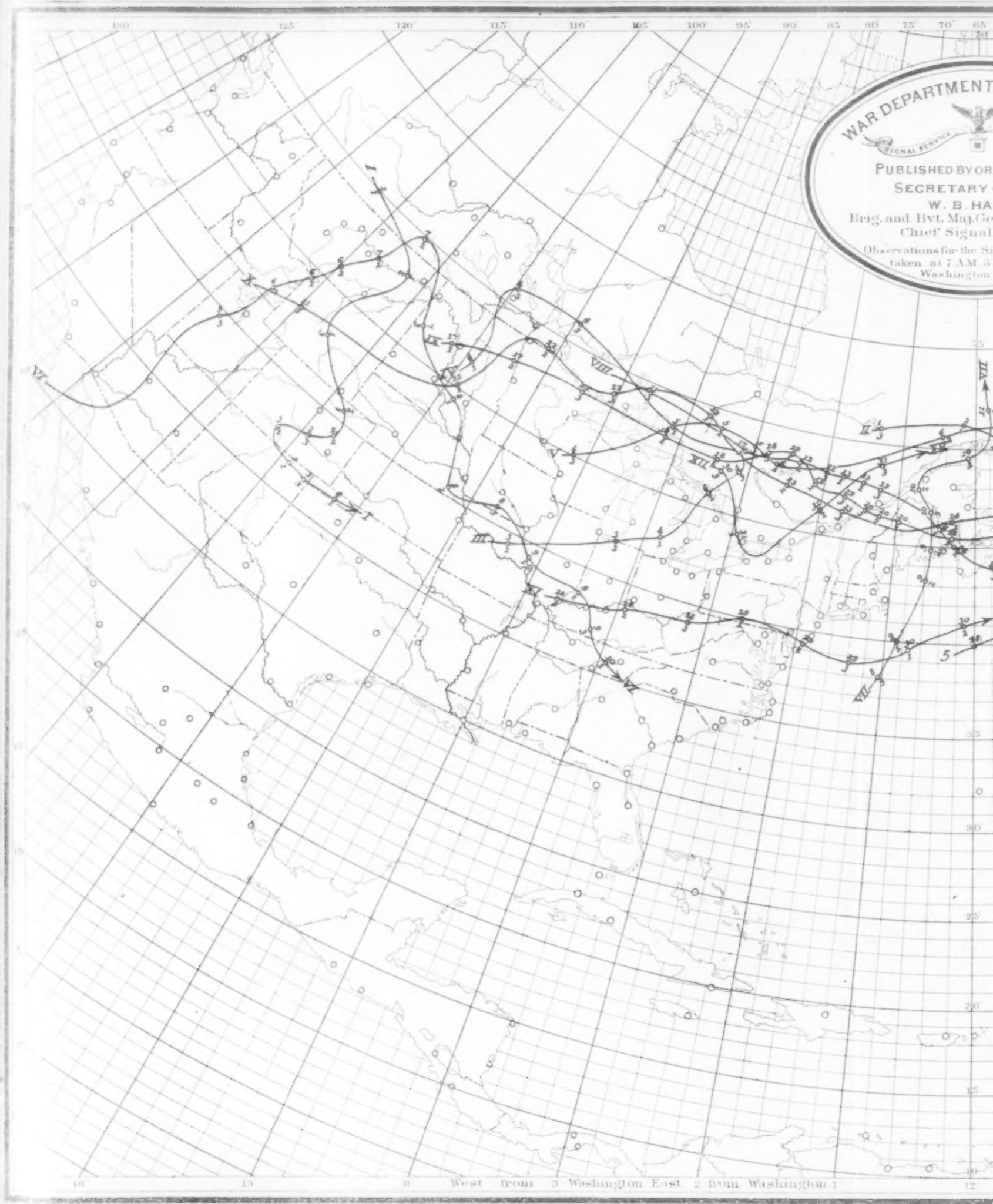
ERRATUM.

In the June REVIEW on page 155, under the heading "Mirage," the phenomenon reported by Mr. Crawford was not seen at Allegheny City, but at Leetsdale, and the hill referred to was situated between the natural gas well and Leetsdale.

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Barometer Areas, July, 1884.

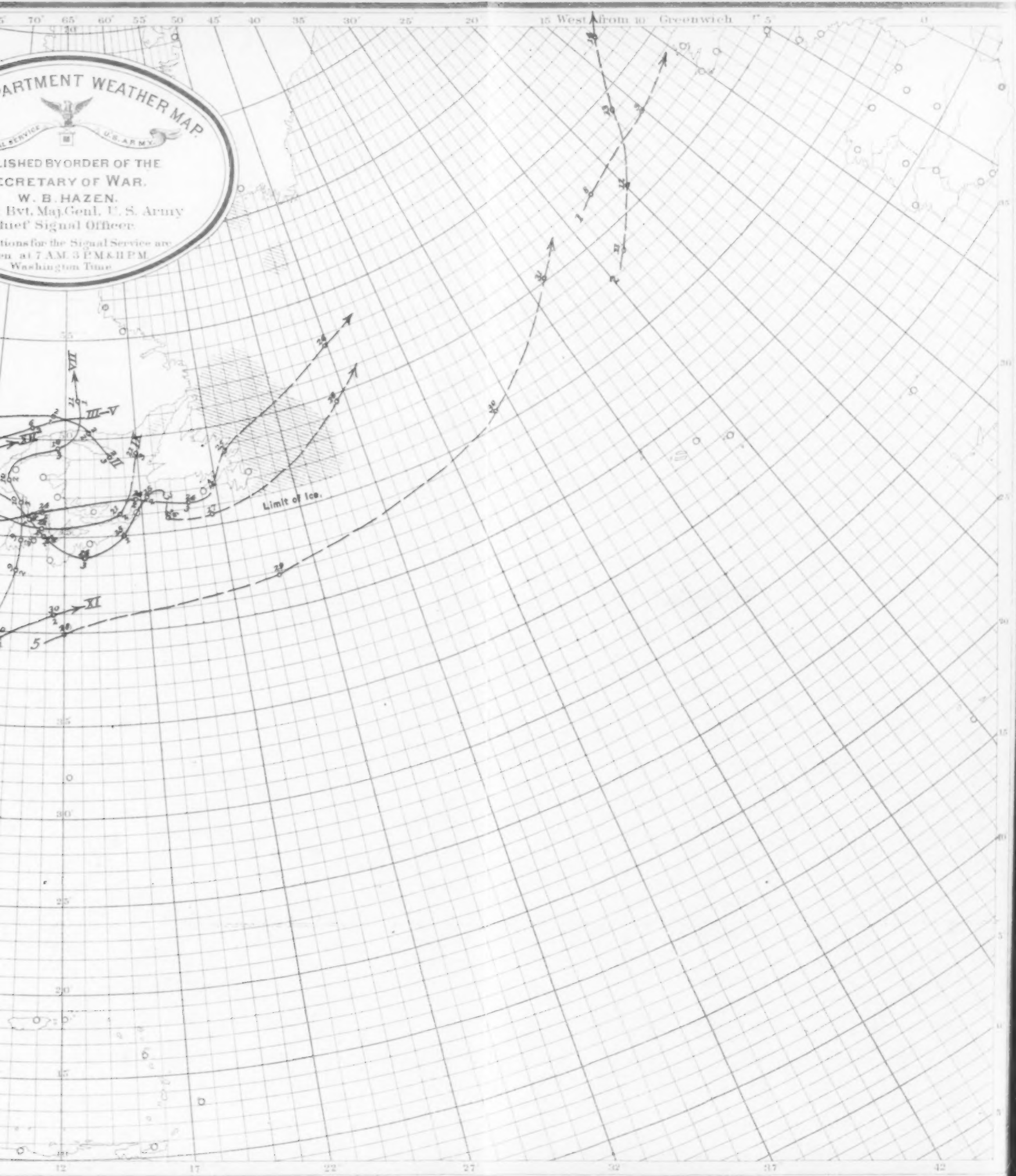


Chart II Isotherms, Isotherms, and Winds. July, 1884.

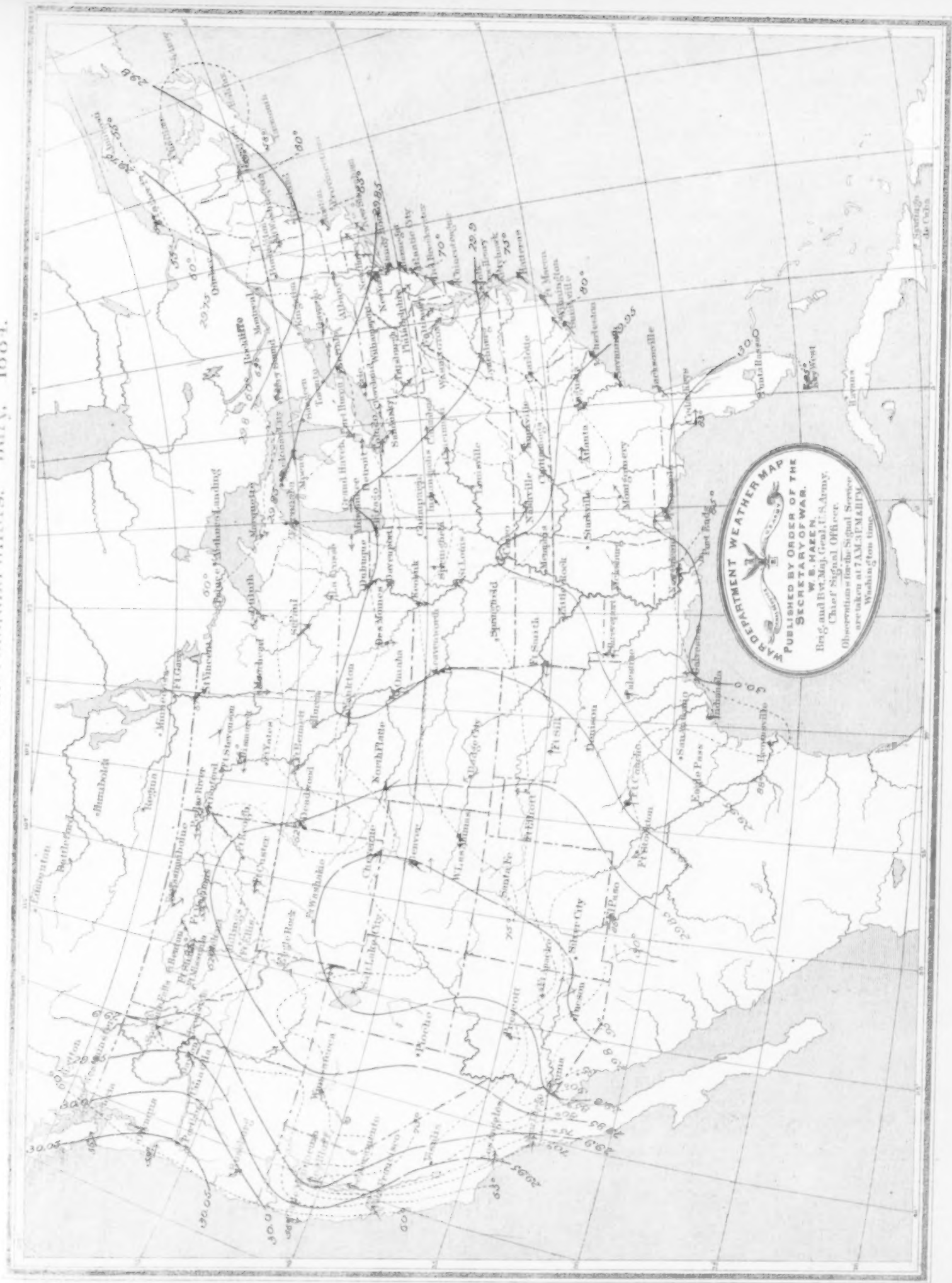
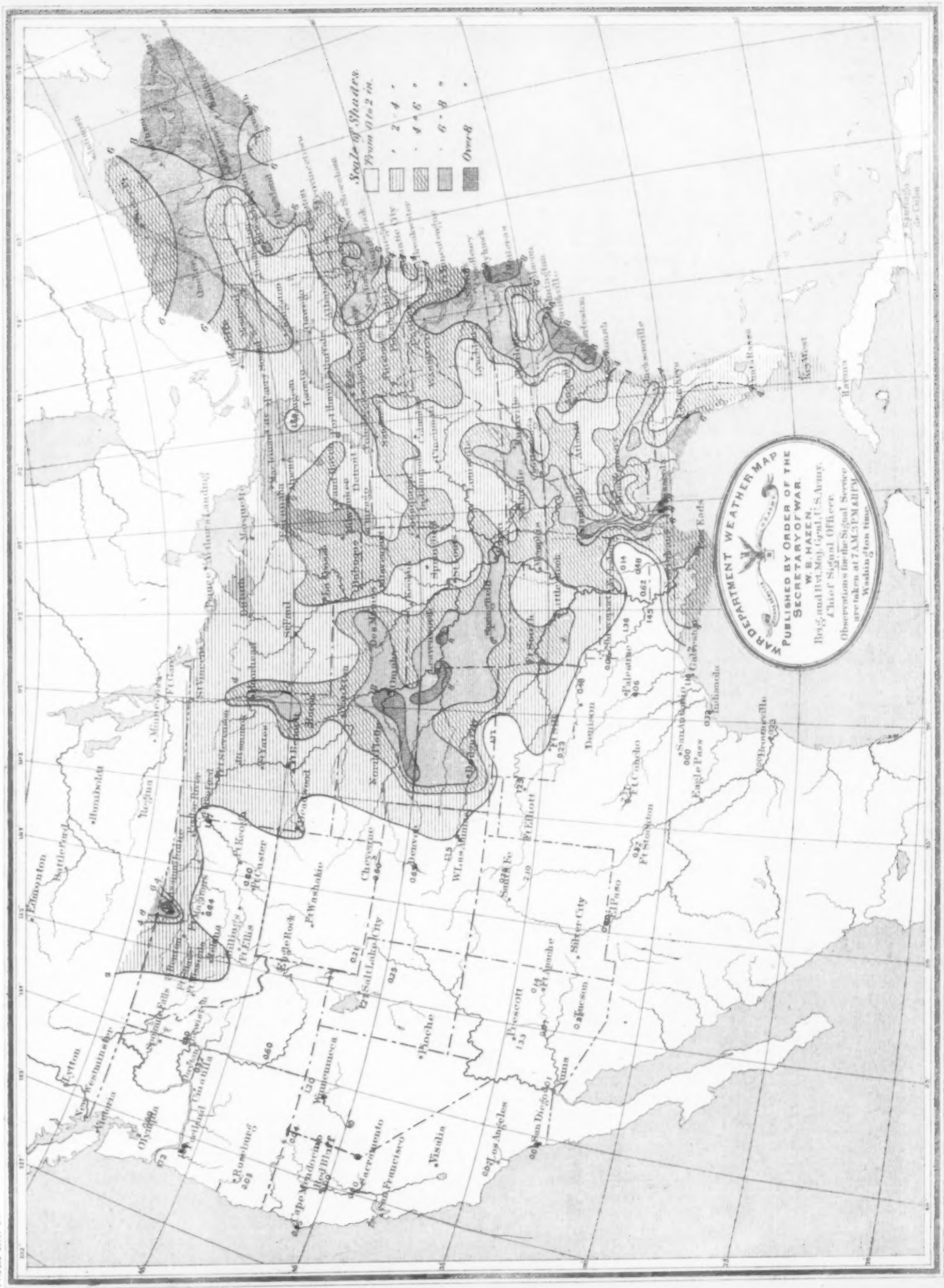


Chart III Precipitation, July, 1884.

Form 106 F



Signal Office, Wash.